THE Journal

AUGUST

1950

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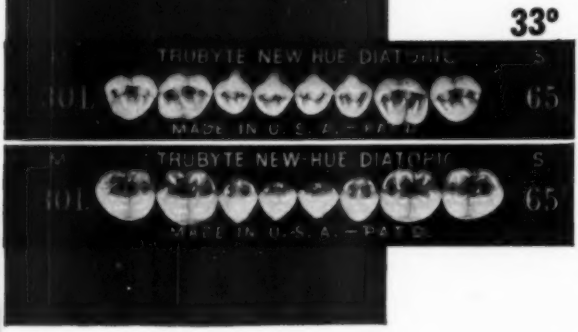

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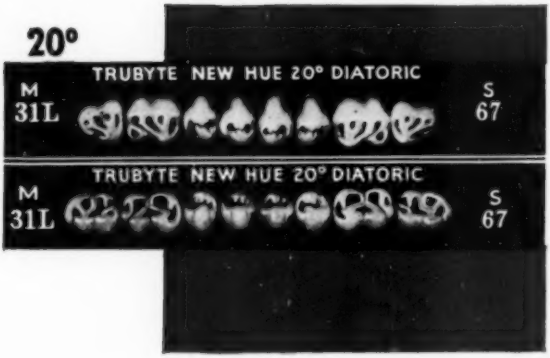

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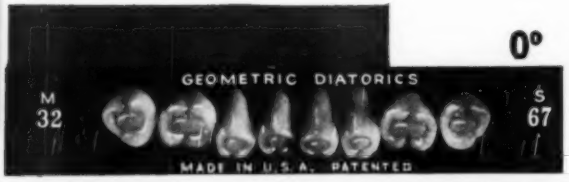

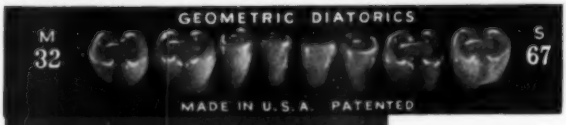

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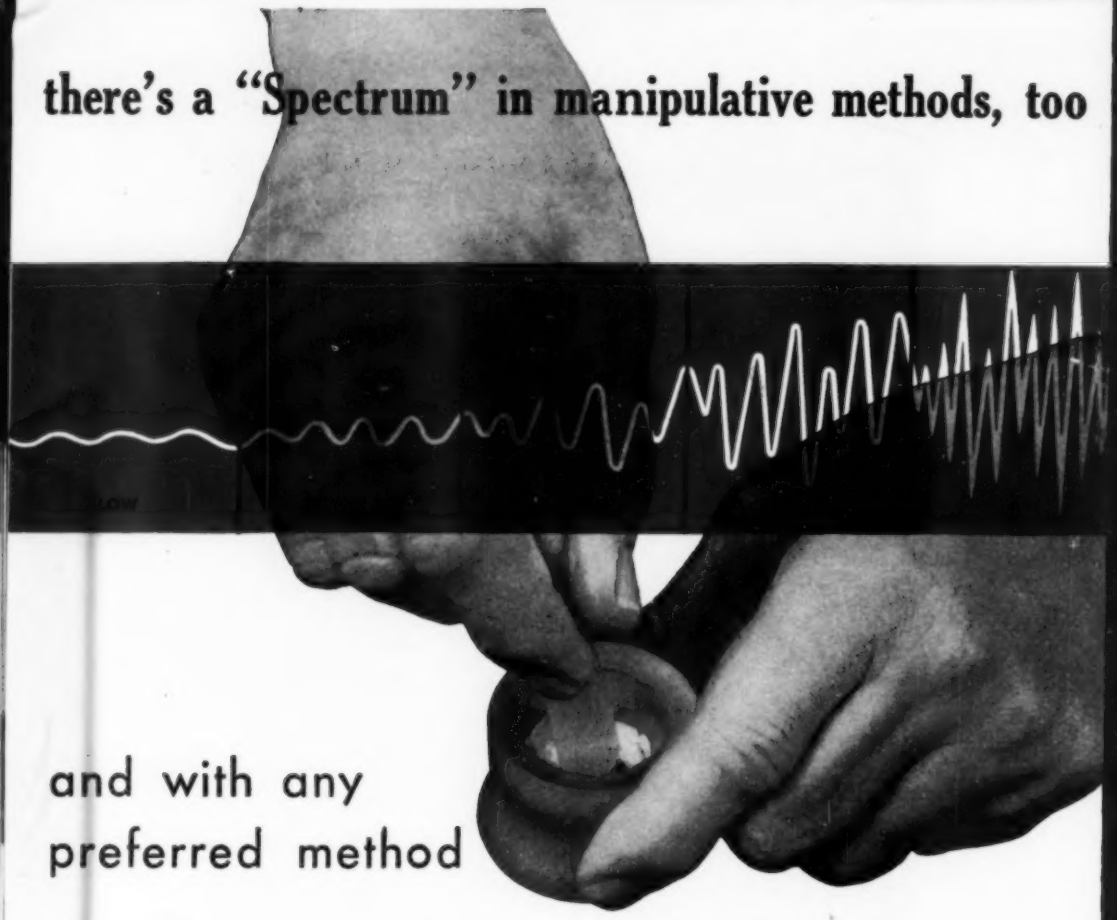

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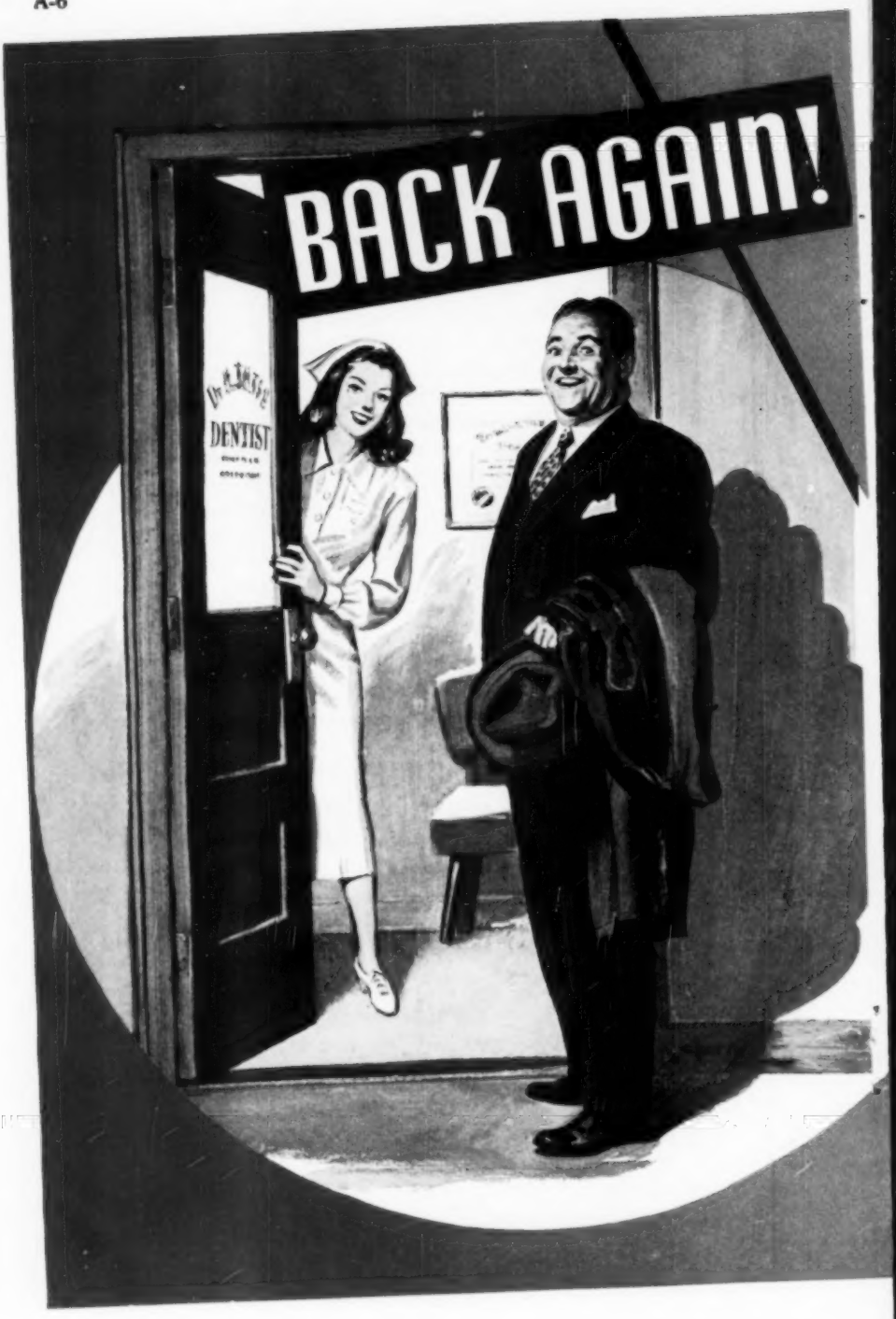
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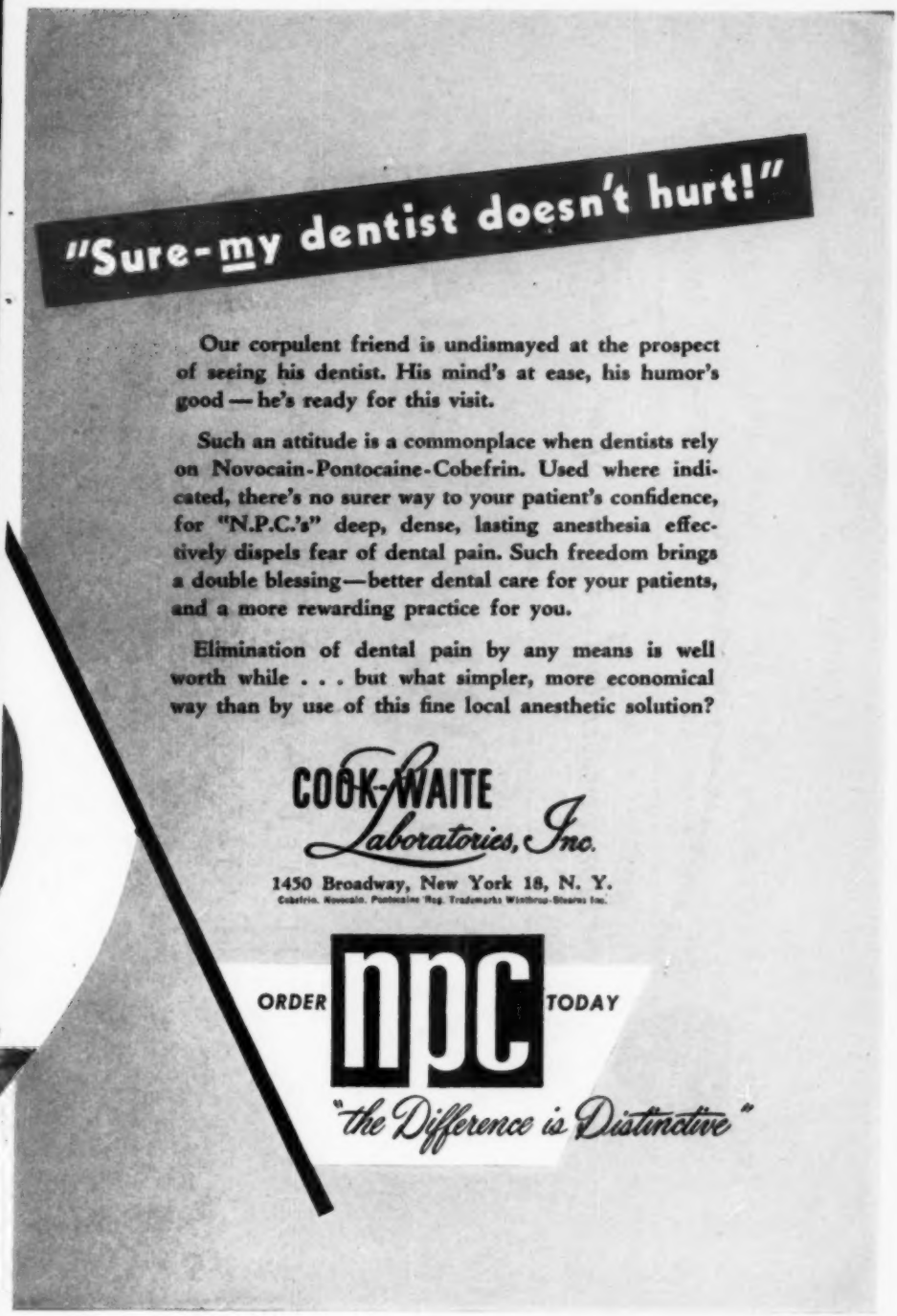
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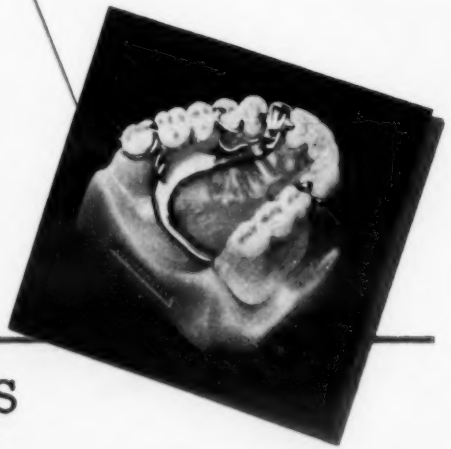

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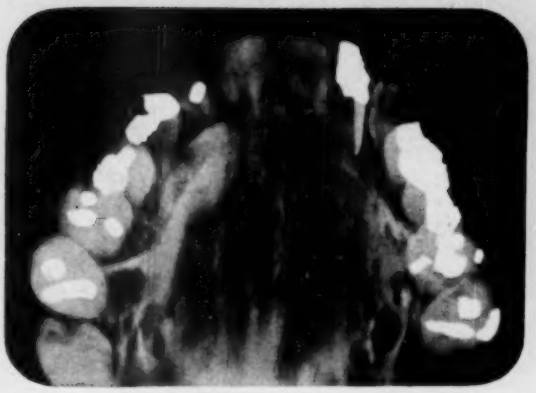

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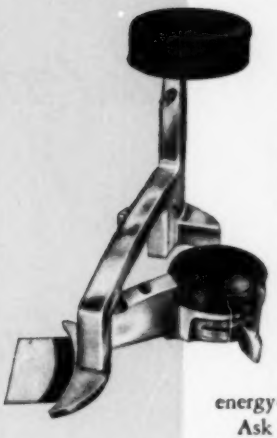

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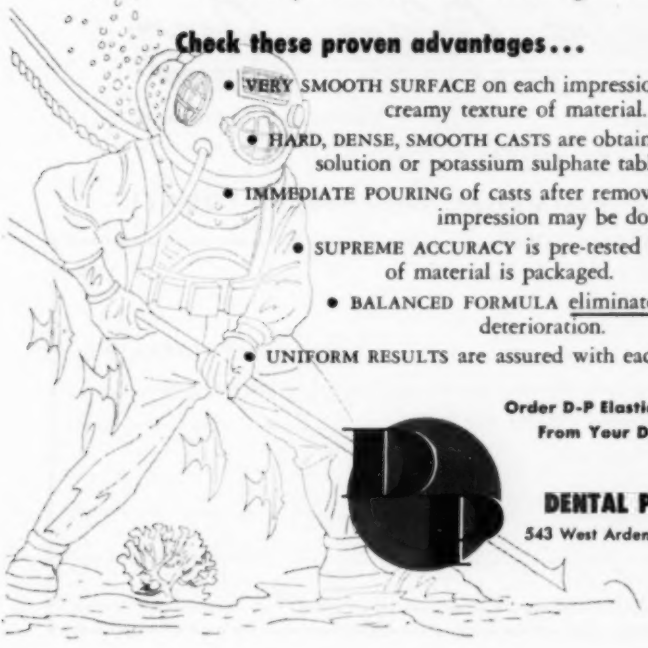

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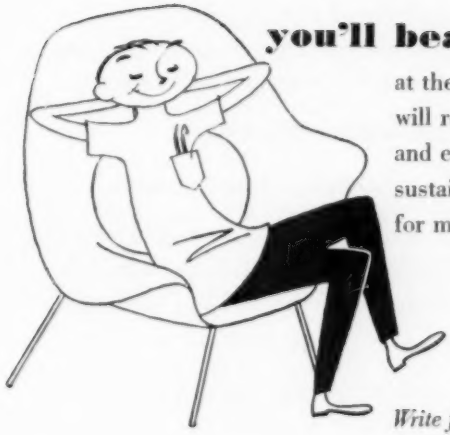

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AUGUST 1950 VOLUME 41 • NUMBER 2

THE Journal OF THE AMERICAN DENTAL ASSOCIATION

Rapid diffuse penetration of intact enamel and dentin by carbon 14 -labeled urea

Wm. Ward Wainwright, D.D.S., M.S.,*
and Frank A. Lemoine, D.D.S., Los Alamos, N.Mex.

Attention has been focused upon the possibility of a caries inhibiting effect of urea by the observation of Stephan[1] that acid formation under plaques is decreased following the use of a urea mouthwash. Urea was found by Kesel, O'Donnell, Kirch, and Wach[2] to enhance the inhibitory action of dibasic ammonium phosphate on lactobacillus growth in cultures and the reduction of salivary lactobacillus counts of caries active individuals. The Illinois group related the effect of urea and dibasic ammonium phosphate to the release of ammonium ions, which in the case of urea is aided by the presence of small amounts of urease in the oral environment. More recently, reduction of caries incidence has been reported after home use of a 21 per cent urea mouthwash[3] and an ammoniated dentifrice with a high urea content.[4]

In addition to its potential ability to produce ammonium ions, urea has several interesting properties which may affect its anticarious activity. It is highly diffusible; it is of small molecular size; it is bacteriostatic;[5] and it is an enzyme

Based on work performed under U. S. Government Contract No. W-7405-Eng-36 with the Los Alamos Scientific Laboratory of the University of California.

Read before the Atomic Energy Program Committee of the First District Dental Society of New York, January 29, 1950, New York, N. Y.

Los Alamos Scientific Laboratory of the University of California, and the Dental Clinic, Los Alamos Medical Center, Los Alamos, N. Mex.

*On leave from Washington University.

The urea was synthesized with C^{14} obtained on allocation from the Isotopes Division of the United States Atomic Energy Commission.

1. Stephan, R. M., The effect of urea in counteracting the influence of carbohydrates on the pH of dental plaques. J. D. Res. 22:63 (Feb.) 1943.

2. Kesel, R. G., O'Donnel, J. F.; Kirch, E. R., and Wach, E. C., The biological production and the therapeutic use of ammonia in the oral cavity in relation to dental caries prevention. J.A.D.A. 33:695 (June) 1946.

3. Goodfriend, D. J., A practical method for prevention of dental caries. J.A.D.A. 37:511 (Nov.) 1948.

4. Henschel, C. J., and Lieber, L., Caries incidence reduction by unsupervised use of 27.5 per cent ammonium therapy dentifrice. J. D. Res. 28:248 (June) 1949.

5. Weinstein, L., and McDonald, A., The effect of urea, urethane and other carbamates on bacterial growth. Science 101:44 (Jan. 12) 1945.

inhibitor.[6] One of the first possibilities suggested by these characteristics would be that of great penetrating power.

Most of our knowledge of the penetration of substances applied to teeth is derived from the behavior of silver nitrate, which is in general use as an antiseptic agent and can be traced since it is readily reduced to black metallic silver. The chemical and physical properties of urea are so different from those of silver nitrate that it is possible that urea behaves very differently when in contact with teeth. Several investigators (Frisbie and Nuckolls,[7] Gottlieb,[8,9] and review by Leicester[10]) have placed emphasis on the organic tracts and matrix of enamel as pathways of decay. The possibility exists that urea can penetrate lamellae, as do silver nitrate[11] and zinc chloride.[12]

With the announcement of the synthesis of radioactive urea,[13] it has become possible to trace the penetration of this substance into intact and carious enamel.

MATERIAL AND METHODS

Radioactive urea labeled with C^{14} (half-life 5,100 years) was used. The specific activity of this compound was very high (55.6 μc./mg.) and permitted the preparation of a 1.7 per cent solution of urea in water with a specific activity of 924 μc. per milliliter.

The detailed treatment of the teeth is given below under "Description of Specimens and Radioautographs." Unless otherwise noted, each tooth was washed immediately at the time of extraction, pumiced, washed, dried with absorbent paper and warm air blast, washed with benzene, dried, its root mounted in wax, and about 10 minutes after extraction approximately .02 ml. of the radioactive solution was spread over the surface of the crown with a capillary pipette and kept evenly spread and moist for five minutes. The tooth was allowed to dry at room temperature in a relative humidity of approximately 20 per cent for 15 minutes to 17½ hours. Some were dried in an oven at 37° C. for 30 minutes. The entire tooth was then embedded[14] in a clear plastic, Selectron, and cured over night at 37° C. The next day the tooth was sectioned and smoothed under oil with disks and sandpaper. The oil and grindings were washed off with xylene and the specimen dried. If any grindings were visible, the specimen was brushed under xylene and dried.

The radioactivity of the specimens was measured with a Tracerlab mica window tube (TGC-2) and laboratory monitor (SU-3) with a counting rate meter, and radioautographic exposure time was estimated.[15] The activity varied from zero in some root sections to 18,000 counts per minute in carious crowns. The activity of the crown sections was about 1,000 to 3,000 c. per minute. Radioautographs were made[16] on Eastman Kodak Ultraspeed dental x-ray film and Eastman Kodak Industrial x-ray plates Type A (single coated, 25 μ thickness, 1 x 3 inches). The elapsed time from urea application to beginning of radioautographic exposure was approximately 24 hours.

6. Stephan, R. M., Two factors of possible importance in relation to the etiology and treatment of dental caries and other diseases. Science 92: 578 (Dec. 20) 1940.

7. Frisbie, H. E., and Nuckolls, J., Caries of the enamel; a histopathological study of the human enamel operating beneath apparently sound and intact enamel surfaces. J. D. Res. 26:181 (June) 1947.

8. Gottlieb, B., Dental Caries. Philadelphia: Lea & Febiger, 1947.

9. Gottlieb, B., The use of alkaline dentifrices and alkaline mouthwashes for caries reduction. Texas D. J. 67:48 (Feb.) 1949.

10. Leicester, H. M., Biochemistry of the Teeth, St. Louis: C. V. Mosby Co., 1949.

11. Ross, W. S., Diffusion experiments with silver nitrate. Brit. D. J. 71:379 (Dec. 15) 1941.

12. Wainwright, W. W., Radioautographic determination of enamel impregnation with isotopes of zinc. In preparation.

13. Murray, A., III, and Ronzio, A. R., Micro-synthesis with tracer elements. I. A new synthesis of cyanamide. The synthesis of urea labeled with C^{14}. J. Am. Chem. Soc. 71:2245 (June) 1949.

14. Wainwright, W. W., Dentistry and the atomic energy program. New York J. Den. 19:325 (Oct.) 1949.

15. Wainwright, W. W., and Anderson, E. C., Isotope selection for radioautography and nomogram for exposure calculation. In preparation.

16. Wainwright, W. W., Detail and survey radioautographs. Science 109: 585 (June 10) 1949.

A random selection was made of teeth extracted at the dental clinic of the Los Alamos Medical Center from November 22, 1949, to December 8, 1949. The patients included 6 males, ages 17 to 36 years, and 5 females, ages 16 to 56 years. In two cases, teeth from multiple extractions were used. Teeth 246 and 247 are from patient B. D. and teeth 233, 234, and 237 are from patient B. S.

In the following description of material and radioautographs, the maximum depth of penetration for each tooth is recorded. This figure is believed to be greater than the actual penetration in many specimens, since some sections were not made at 90 degrees to the surface. This is epecially true of sections near the occlusal or proximal surfaces, as in the case of specimen 888. Root specimens will be described separately.[17]

DESCRIPTION OF SPECIMENS AND RADIOAUTOGRAPHS

Tooth 246 • Upper right third molar, erupted 14 years, malposed, fissure caries. Not cleansed; only water washed, dried. Within three minutes after extraction, urea applied to crown and upper two-thirds of root; dried 1¾ hours; surface washed with stream of 15 ml. distilled water for 30 seconds; air dried 3½ hours. (Patient B. D., male, 32 years.)

Specimen 882 • Transverse section, occlusal to contact point, diffuse penetration 1.6 mm. to dentoenamel junction, penetration of carious fissure, weak diffuse penetration of all dentin (R. A.-A408). Root Specimen (884) shows pulp penetration and weak diffuse penetration of all dentin.

Tooth 247 • Upper left third molar, erupted 14 years, malposed, fissure caries. Treatment same as tooth 246. (Patient B. D., male, 32 years.)

Specimen 880 • Transverse section, occlusal to contact point, diffuse penetration 0.5 mm. to dentoenamel junction, urea concentration in fissures (R. A.-A395).

Specimen 881 • Transverse section, gingival to contact point, diffuse penetration 1.0 mm. to dentoenamel junction, urea concentration at pulpal horns, weak diffuse penetration of all dentin (R. A.-A405).

Tooth 241 • Upper right first bicuspid erupted 6 years, removed to facilitate orthodontic treatment, enamel caries mesial and distal surfaces. Treatment same as tooth 246, except tooth in moist gauze 30 minutes before urea application, final drying period 17½ hours. (Patient J. C., female, 16 years.)

Specimen 890 • Transverse section, gingival to contact point, diffuse penetration 1.3 mm. through enamel plus 0.4 mm. into dentin, 1.7 mm. total penetration. Urea concentration in carious dentin (R. A.-A426).

Tooth 239 • Upper right cuspid, erupted 45 years, paradentosis, distal silicate, secondary caries. Treatment same as tooth 241 except final drying 1 hour at 37° C. (Patient C. R., female, 56 years.)

Specimen 915 • Longitudinal section, distal half, enamel penetration 0.1 mm., enamel thickness 2.0 mm., urea concentration in discolored dentin under silicate (R. A.-A424).

Tooth 244 • Upper right cuspid, erupted 25 years, preparation for dentures, distal alloy. Not cleansed, only water washed, dried. One hour after extraction urea applied to labial and lingual surfaces within marked area; dried 5 hours; not washed. (Patient J. D., male, 36 years.)

Specimen 885 • Longitudinal section, distal half, enamel penetration 0.1 mm., enamel thickness 1.6 mm., (R. A.-A422).

Specimen 886 • Longitudinal section, mesial half, diffuse and localized line penetration (R. A.-A406).

Tooth 248 • Upper left first molar, erupted 26 years, pathological exposure, occlusal alloy. Treatment same as tooth 246 except tooth in moist gauze 35 minutes before urea application and urea applied to crown and open disto-occlusal, partially prepared cavity. (Patient J. R., male, 32 years.)

Specimen 892 • Transverse section, occlusal to contact point, diffuse penetration 1.1 mm. through enamel plus 0.4 mm. into dentin, 1.5 mm. total penetration. Urea concentration in lamella and in two enamel cracks. Dif-

17. Lemoine, F. A., Penetration of cementum by radioactive urea. In preparation.

fuse penetration 0.5 mm. into dentin of exposed cavity wall (R. A.-A425). Root specimen (894) shows pulp penetration.

Specimen 893 • Transverse section of crown near cementoenamel junction, diffuse penetration 0.1 mm. through enamel plus 0.4 mm. into dentin, 0.5 mm. total penetration. Diffuse penetration 1.0 mm. into dentin of exposed cavity wall (R. A.-419).

Tooth 243 • Upper left third molar, erupted 2 years, malposed, occlusal caries, tissue and calculus adherent. Within 3 minutes after extraction urea applied to crown, dried 2 hours, immersed in ammoniacal silver nitrate 30 seconds, dried on absorbent paper, immersed in 10 per cent formaldehyde 30 seconds, dried on towel. (Patient A. B., female, 22 years.)

Specimen 878 • Transverse section at contact point, diffuse penetration 1.3 mm. to dentoenamel junction. Urea concentration in carious fissure; weak diffuse penetration of all dentin (R. A.-A397).

Tooth 232 • Upper left third molar, erupted 10 years, paradentosis, deep occlusal fissure. Urea applied to crown, dried 4 hours, surface washed with stream of 15 ml. distilled water for 30 seconds; air dried 2½ hours. (Patient S. H., male, 30 years.)

Specimen 857 • Transverse section, occlusal to contact point, diffuse penetration 1.1 mm. to dentoenamel junction. Urea concentration in intact enamel near occlusal fissures (R. A.-A167).

Specimen 858 • Transverse section, gingival to contact point, diffuse penetration 0.4 mm. through enamel plus 0.3 mm. into dentin, 0.7 mm. total penetration (R. A.-A176).

Tooth 238 • Upper left third molar, erupted 9 years, malposed, occlusal caries. Treatment same as tooth 246 except urea dried 16 hours, after distilled water wash dried at 37° C. 1 hour. (Patient A. H., male, 27 years.)

Specimen 874 • Transverse section near contact point, diffuse penetration 0.5 mm. through enamel plus 0.2 mm. into dentin, 0.7 mm. total penetration, carious pits penetrated (R. A.-A394).

Specimen 875 • Transverse section of crown near cementoenamel junction, diffuse penetration 0.6 mm. to dentoenamel junction (R. A.-A404).

Tooth 249 • Lower right third molar, erupted 5 years, malposed, noncarious. Treatment same as tooth 244, dried 1½ hours. (Patient M. M., female, 23 years.)

Specimen 887 • Longitudinal section, lingual portion, diffuse central penetration (R. A.-A417).

Specimen 888 • Longitudinal section, buccal portion, diffuse penetration 2.5 mm. through enamel plus 3.9 mm. into dentin, 6.4 mm. total penetration. Pulp penetrated, weak diffuse penetration of all dentin (R. A.-A409).

Tooth 233 • Lower right second bicuspid, erupted 31 years, paradentosis, distobuccal alloy. Treatment same as tooth 246, except dried 2⅓ hours, no distilled water wash. (Patient B. S., female, 43 years.)

Specimen 862 • Transverse section near contact point, diffuse penetration 0.9 mm. through enamel plus 1.3 mm. into dentin, 2.2 mm. total penetration. Urea concentration in blackened dentin under alloy (R. A.-A177).

Root specimens (861, 864) show pulp penetration.

Specimen 863 • Transverse section occlusal to contact point, diffuse penetration 0.4 mm., enamel thickness 1.3 mm. Urea concentration in carious fissure and in discolored dentin under alloy (R. A.-A172).

Tooth 234 • Lower right first bicuspid, erupted 32 years, paradentosis, mesial alloy, adherent tissue and calculus. Not cleansed, only water washed, dried. Tooth in moist gauze 2½ hours before urea application, dried 15 minutes, immersed in ammoniacal silver nitrate 1½ hours, dried, immersed in 10 per cent formaldehyde 20 minutes. (Patient B. S., female, 43 years.)

Specimen 867 • Transverse section at contact point, enamel penetration 0.1 mm., enamel thickness 0.4 mm. Urea concentration in 2 enamel cracks, in silver oxyphosphate cement, and in grayish black dentin under alloy and cement (R. A.-A180).

Specimen 868 • Transverse section crown at cementoenamel junction, enamel penetration 0.1 mm., enamel thickness 1.4 mm., complete penetration under overhanging alloy. Urea concentration in 2 enamel cracks under overhang (R. A.-A179).

Tooth 237 • Lower left cuspid, erupted 30 years, paradentosis, noncarious. Not cleansed, only water washed, dried. One

hour after extraction urea applied to crown and upper ⅔ of root, dried 15 minutes, immersed in 10 per cent formaldehyde 20 minutes, dried in air blast. (Patient B. S., female, 43 years.)

Specimen 914 • Longitudinal section, distal half, enamel penetration 0.1 mm., enamel thickness 1.6 mm. Pulp penetrated; urea concentration in enamel crack (R. A.-A429).

Tooth 245 • Lower left second molar, erupted 5 years, pulpitis, large occlusal alloy. Treatment same as tooth 246 except tooth in moist gauze 15 minutes before urea application and dried 2½ hours after urea application. (Patient D. D., male, 17 years.)

Specimen 898 • Transverse section at contact point, diffuse penetration 1.0 mm. through enamel plus 0.5 mm. into dentin, 1.5 mm. total penetration. Urea concentration in silver oxyphosphate cement with lack of penetration into zinc oxide and eugenol base (R. A.-A421).

FINDINGS

Penetration of a diffuse type was found through intact enamel as well as through lamellae, cracks, and carious lesions. A typical radioautograph is shown in Figure 1. The radioactive urea appears to have penetrated irregularly, although freely, to the dentoenamel junction in this erupted tooth. Only one area of dentin penetration was visible in the original near the dentoenamel junction at the middle of the buccal surface. The penetration follows a radial pattern suggestive of the arrangement of enamel rods. It is not discernible from these survey radioautographs whether the rod sheaths are the pathway of penetration. The central dense areas are in a region near the occlusal fissures, but the enamel is intact and completely calcified as far as can be judged by examination of the unstained specimen at a magnification of 30 times.

Figure 2 is another specimen from the same tooth as in Figure 1, but taken from an area of thinner enamel. The same diffuse penetration of intact enamel is shown plus a frequent passage through the dentoenamel junction into the dentin. The pattern of penetration of the dentoenamel junction is similar to that of caries in that the radioactive urea penetrates at isolated points and again spreads diffusely into the dentin (Applebaum and Adam[18]).

Another tooth (Fig. 3) from a different individual shows the same diffuse penetration of enamel. This transverse section near the occlusal surface shows penetration of carious fissures which are open and discolored.

The most extreme penetration observed in the 14 teeth examined is illustrated in Figure 4. The intact enamel of this erupted tooth (249) is diffusely and intensely penetrated; however, two bands of enamel are penetrated more deeply to the dentoenamel junction. One band is continued in the dentin to a further depth on the radioautograph of 3.9 mm. The dentin penetration, although diffuse, obviously follows the pattern of the dentinal tubules. The corresponding band of dentin is transparent in the specimen. The pathway through transparent dentin is like that observed by Bartelstone[19] in teeth of individuals who have been injected with radioactive iodine. Although the direct path of penetration is interrupted, possibly by a turning, before the pulp chamber is reached, the radioautograph indicates activity in the pulp. The entire dentin area of this specimen is diffusely, though faintly, exposed. The deep penetration to the pulp and the over-all spread of urea through the dentin of this intact tooth are believed to have required a large part of the 24 hours from the time of urea application to the time of sectioning. In water solutions urea is one of the most diffusible substances known. It is suggested that the

18. Applebaum, E., and Adam, T. H., Decalcification versus mechanical injury in caries. J. D. Res. 17:95 (April) 1938.

19. Bartelstone, H. J., Use of radioactive iodine as a tracer in the study of the physiology of teeth. II. Uptake by human teeth. Abs. J. D. Res. 28:658 (Dec.) 1949.

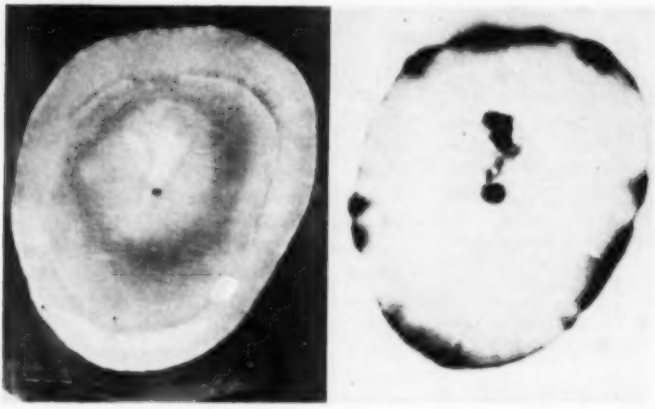

Fig. 1 • Rapid diffuse penetration of enamel by C^{14}-labeled urea. Upper left third molar, transverse section, occlusal to contact point. (Patient S. H., Spec. 857, Plate 13243; R. A.-A167, Plate 12871)

five minutes during which the urea solution kept the surface moist, plus the initial minute or two of the drying period, was sufficient for the urea to penetrate into the dentin, and that the further diffusion to the pulp and spread throughout the entire dentin were possible because of the fresh moist condition of the pulp and dentin. The embedding in plastic served to seal inner moisture in the tooth in spite of the drying of the surface enamel before and after urea application. At the time of sectioning, the pulp was observed to be moist. Pulp penetration was found in three other teeth (246, 248, 237); while another tooth (247) showed activity in the plane of the pulpal horns. Four teeth (246, 247, 243, 249) showed a weak diffuse penetration throughout all of the dentin.

A survey of the maximum depth to which urea penetrated the enamel of each of the 14 teeth observed is given in the bar diagram of Figure 5. Four teeth (239, 244, 234, 237) with only 0.1 mm. penetration were separated on the left,

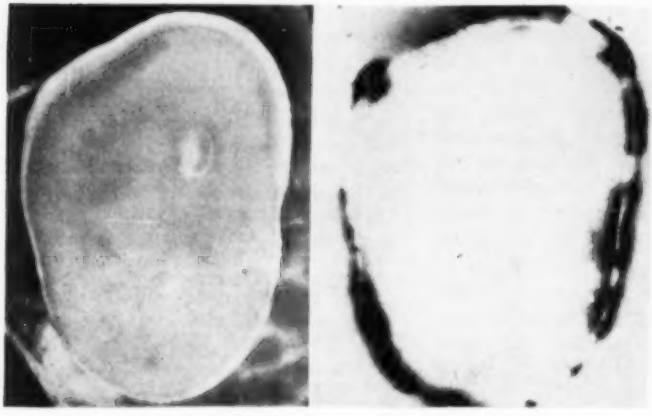

Fig. 2 • Rapid diffuse penetration of enamel and dentin by C^{14}-labeled urea. Upper left third molar, transverse section, gingival to contact point. (Patient S. H.; Spec. 858, Plate 13240; R. A.-A176, Plate 12872)

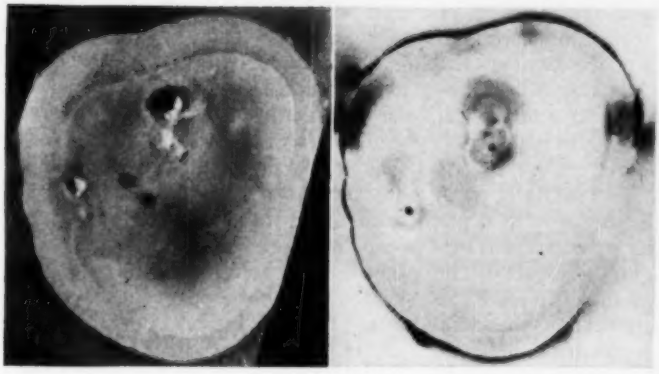

Fig. 3 • Rapid diffuse penetration of intact enamel and dentin, and carious fissures by C^{14}-labeled urea. Upper left third molar, transverse section near contact point. (Patient A. H.; Spec. 874, Plate 13270; R. A.-A394, Plate 13261.)

since this depth is indistinguishable from activity on the surface only. All of the remainder showed penetration to a depth of 0.4 mm. or more through intact enamel. The average maximum enamel penetration of all teeth was 0.9 mm.

In the radioautographs of the four teeth described as showing 0.1 mm. enamel penetration, the blackening of the film is only a dense line corresponding to the position of the surface of the enamel. In two of these (239, 244) there can be no distinction between the possibility of slight penetration, adsorption on the enamel surface, and mere drying of the urea solution on the surface. Of the other two, however, one tooth (234) had been immersed successively in ammoniacal silver nitrate (1½ hours) and 10 per cent formaldehyde (20 minutes) and the other (237) in 10 per cent formaldehyde (20 minutes). These two teeth (234, 237) were from the same patient. A third tooth (233) from this patient was not immersed and showed a total of 2.2 mm. penetration. This sug-

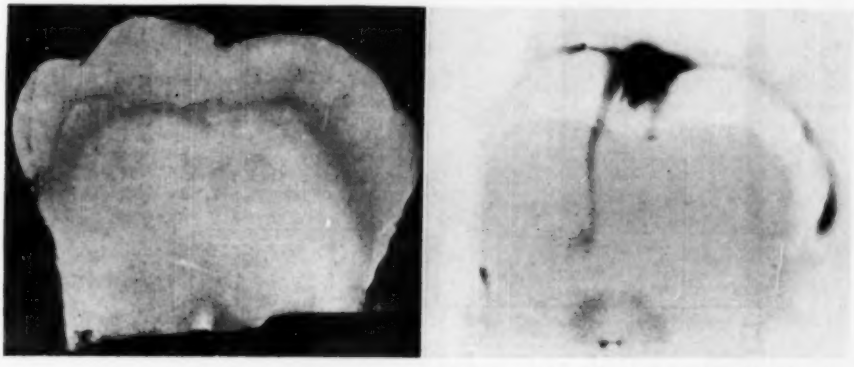

Fig. 4 • Diffuse penetration through intact enamel, with deep penetration of transparent dentin and penetration of pulp by C^{14}-labeled urea. Lower right third molar, longitudinal section of crown, buccal portion. (Patient M. M.; Spec. 888, Plate 13271; R. A.-A447, Plate 13263.)

gests study of a possible withdrawal of urea from enamel while immersed. On the other hand, urea penetration was not noticeably affected in tooth 243 by immersion for 30 seconds in ammoniacal silver nitrate and for 30 seconds in 10 per cent formaldehyde.

The possibility of relationship of tooth type and location in the arch to depth of enamel and dentin penetration is surveyed in the bar diagram of Figure 6. The bars are arranged so that the solid line represents enamel penetration, the cross-line represents the dentoenamel junction, and the broken line represents dentin penetration. Although the number of teeth studied is too few, an extension of observation is indicated since the least penetration was observed in anterior teeth. Although the greatest penetration was found in third molars, it was not different from the penetration observed in other molars and in bicuspids. Hence the data cannot be considered weighted by the large number of third molars.

The relation of depth of penetration to posteruptive age is analyzed in Figure 7. Little effect of posteruptive change[10] is to be seen in these teeth, although the observation is of little significance since no unerupted teeth were studied and the shortest exposure to oral fluids was two years. The fact, however, that the four teeth with little or no penetration had been erupted 25 years or more suggests further investigation of age changes.

COMMENT

In view of the unusual nature of the findings and the extreme sensitivity of the method, the possibility of smearing minute traces of radioactive urea from the area of application over the surface of the section during grinding must be considered. This possibility is quickly

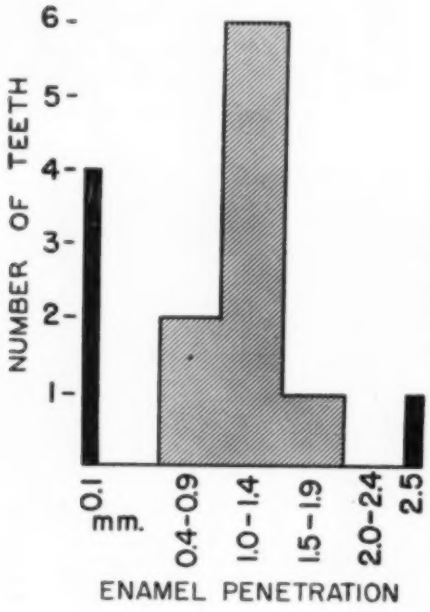

Fig. 5 • Frequency distribution of 14 teeth according to depth of enamel penetration in millimeters. Shaded bars show number of teeth with depths of penetration contained in the indicated ranges in millimeters; solid bars show number of teeth with 0.1 or 2.5 mm. of enamel penetration. (Plate 002102)

discarded when it is seen that the distribution in the radioautograph corresponds to a nonuniform pattern of anatomical arrangements and that there is no exposure over the entire area of plastic and over large areas of enamel and dentin. In order to test the possibility, however, four specimens (885, 886, 887, 888) were prepared in such a manner that if the grinding operation smeared the radioactive urea over the surface of the section it could not include urea from the original area of surface application. The area of application was isolated with a mark from a wax pencil; radioactive urea was applied and allowed to dry. The specimen was embedded in plastic and the grinding performed on the side of the section to which urea was not applied. In all four specimens typical diffuse penetration was found without the possibility of contamination from the surface of the original application.

Radioautographic evidence of penetration does not distinguish the chemical nature of the penetrating compound. If, for instance, ammonium ions are produced from the urea, carbonate would be formed and might penetrate independently. Under the conditions of this experiment this is possible for a very small proportion of the urea molecules and the radioautographic density is interpreted as representing the actual distribution of urea.

The method of application of the radioactive urea to the enamel of the teeth was designed to duplicate the methods of topical application in clinical use. In several respects the circumstances of this *in vitro* study do not correspond to clinical conditions; for instance, the surface of the tooth was kept dry for long periods after application. Among the many factors added to this situation in the mouth, the presence of saliva may be

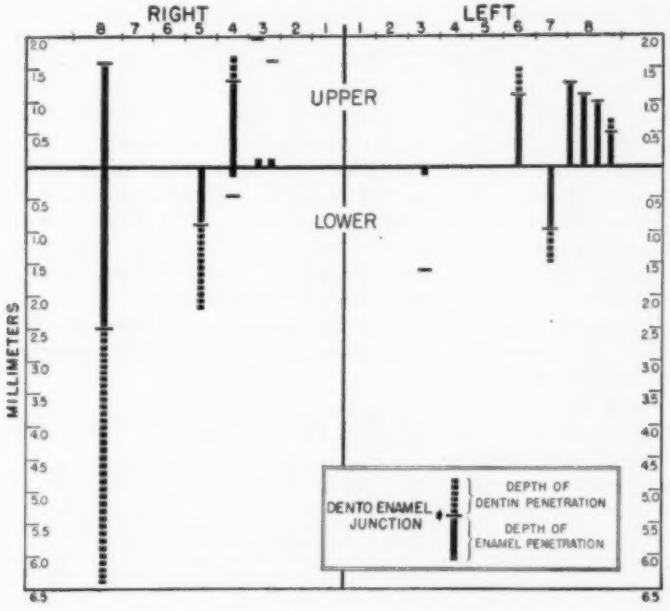

Fig. 6 • Enamel and dentin penetration compared with tooth type and location (Plate 002-107)

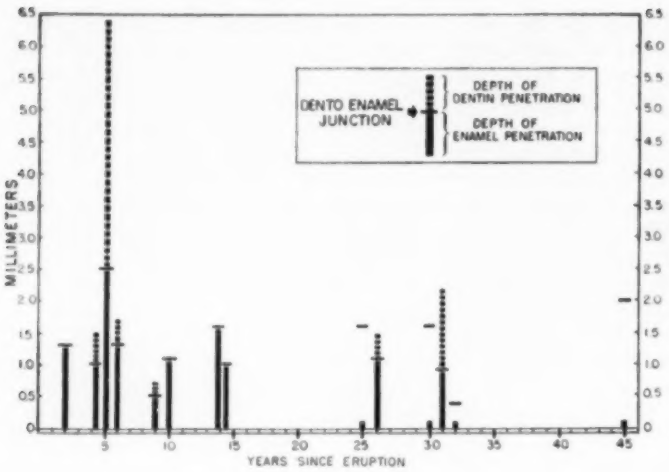

Fig. 7 • Enamel and dentin penetration compared with posteruptive age. (Plate 002100)

suspected of altering diffusion characteristics as suggested by Besic[20] from his observation of greatly increased corrosion of the contacting areas of spheres when proteins were added to the acid solutions.

The diffuse penetration of urea may be no more rapid than the passage of electrolytes through enamel as studied in dialysis and electrophoresis experiments by numerous investigators (whose work is reviewed by Leicester[10] and Berggren[21]). The great sensitivity of the radioautographic method makes it possible to localize extremely minute quantities of radioactive urea. The usual activity of 2,000 counts per minute from the surface of the sections employed in this study corresponds to a total of 0.2 μg. of urea over the entire surface of specimen. It is possible that the investigators who found the enamel permeable to electrolytes also would have observed rapid penetration if their methods had been sensitive to the minute quantities of radioactivity required to expose the radioautograph.

The radioautographic observation of rapid diffuse penetration of urea through enamel confirms the contention of those who observed passage of electrolytes through enamel after long periods of dialysis, that enamel is semipermeable and will pass small molecules (Wannenmacher,[22] Atkinson,[23] and review by Leicester[10]). It is possible that urea can exert its bacteriostatic and enzyme-inhibiting effects in and beyond any invaded portion of a tooth and thereby impress a severe handicap on the growth of the invading organisms and the damaging effects of their enzyme products. This hypothesis can be extended to postulate a class of highly diffusible substances of small molecular size which enter enamel freely and deeply. Some of these may have the power to inhibit whereas others may enhance caries activity.

The necessity of using dyes to disclose penetration has restricted investiga-

20. Besic, F. C., An aspect of diffusion: its possible association with dental caries. J. D. Res. 28:379 (Aug.) 1949.

21. Berggren, H., Permeability of enamel and dentine, Svenk. Tändlak. Tijdsk. 40: Supplement No. 18 1947.

22. Wannenmacher, E., Diffusionsvorgänge in den harten Zahnsubstanzen, insbesondere im Zahnschmelz. Dtsch. Z. M. und Khlk. 5:47, 1938.

23. Atkinson, H. F., An investigation into the permeability of human enamel using osmotic methods. Brit. D. J. 83:205 (Nov. 21) 1947.

tion because of the chemical properties and the comparatively enormous size of these molecules. Radioactive tracers add vast possibilities for extension of knowledge of enamel function and the processes of dental caries control.

SUMMARY AND CONCLUSIONS

Radioautographic studies of the penetration of radioactive urea, or substances derived from it, in 14 freshly extracted human teeth revealed the following:

1. Diffuse penetration of intact enamel occurs without the necessity of following lamellae or cracks.

2. This penetration of enamel takes place possibly within 10 minutes, and is rapid compared to the penetration of dyes which requires 10 to 30 days. This property is doubtless related to the higher diffusibility of urea and its smaller molecular size; which confirms the prediction of earlier workers that enamel is more permeable to small molecules.

3. Communications as disclosed by the passage of the radioisotope between enamel and dentin appear to be infrequent but were observed at various intervals in the sections, in some teeth as close together as 1 to 2 mm.

4. Penetration of the isotope through enamel into the dentin was more frequent near the gingival line and near occlusal fissures.

5. In one tooth the radioactive material was traced continuously from the occlusal surface through grossly intact, noncarious enamel and dentin to the pulp. The penetration occurred within 24 hours. A high concentration of labeled urea was maintained on the surface of the tooth and the pulp was not permitted to dry out. Pulp penetration was found in three other teeth and pulpal horns were penetrated in another. In four of the teeth there was a weak diffuse penetration throughout all of the dentin.

6. It is assumed that it is the urea molecule which has penetrated the teeth but, since the radioautograph detects only the radioactive carbon, further experiments will be necessary to substantiate this interpretation.

7. Radioactive materials and the radioautographic technic are highly effective tools for use in extending studies of enamel permeability. The combination provides a means of grossly visualizing the pathways by which nonstaining substances penetrate enamel.

P. O. Box 1663

Research and Development • "The Nation's postwar budget for research and development during 1947 reached the highest point in our history—more than $1.1 billion." Thus John R. Steelman reports to President Truman in "Science and Public Policy" on the unprecedented volume of our national research effort.

This is a staggering figure when viewed against a total national research expenditure in 1930 of $166 million and of $345 million in 1940. Over a period of 17 years the national budget for research and development has increased more than 560 per cent. *Marion A. Jurgens, "Research Publication: A Federal Responsibility?" Science 110:209, August 26, 1949.*

Control of dental caries by the addition of fluorides to public water supplies

Francis A. Bull, D.D.S., Madison, Wis.

While past research has shown that some degree of control or prevention of dental caries could be obtained, the caries rate as a whole has increased. A comparison of the dental decay rates of servicemen of World War I with those of World War II demonstrates this fact.[1]

EPIDEMIOLOGIC STUDIES

During the past 12 years a mass of epidemiologic evidence has been accumulated which indicates that where fluorine is naturally present in public water supplies the prevalence of caries is less by 60 per cent in permanent teeth. This evidence likewise demonstrates that fluorine is the active caries inhibiting factor in domestic water supplies, and that the maximum protection is obtained at about 1 ppm, at which level objectionable dental fluorosis is eliminated. Surveys by Dean[2] and associates were the first to show that children in the 12 to 14 year age group, who, since birth, had consumed water containing 1 ppm of fluorine had only one-third the amount of dental decay that children had who consumed fluorine-free domestic water. Hardgrove and Bull[3] demonstrated the effect of fluorine in reducing the incidence of dental caries in the deciduous teeth. McKay and Frisch[4] demonstrated that the beneficial effects of drinking fluoride water during the period of tooth calcification continue through adult life. Armstrong and Brekhus[5] showed that the carious tooth contains less fluorine than does the noncarious tooth.

Investigation[6] has shown that fluorine has the same action on experimental animals in reducing tooth decay that it has on humans. Animal research likewise shows that artificially added fluorides produce exactly the same effect as fluorides naturally present in water.

McClure[7] has shown that no toxic effects from the ingestion of fluorides in drinking water, containing as high as 5.5 ppm, can be found, other than mottled enamel. When it is realized that approximately 8,000,000 people in the United States have consumed water containing from 1 to 27 ppm throughout their life, it can be assumed that the medical pro-

Presented before the Research Section, ninetieth annual session of the American Dental Association, San Francisco, October 18, 1949.

Director of Dental Health, Wisconsin State Board of Health, State Office Building, Madison.

1. East, Bion R., Some epidemiological aspects of tooth decay. Am. J. Pub. Health 32:1242 (Nov.) 1942.

2. Dean, H. T., Endemic fluorosis and its relation to dental caries. Pub. Health Rep. 53:1443, (Aug.) 1938.

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4. McKay, F. S., Mass Control of Dental Caries by the Use of Domestic Water Supplies Containing Fluorine. Am. J. Pub. Health 38:828 (June) 1948.

5. Armstrong, W. D., and Brekhus, P. J., Possible relationship between the fluorine content of enamel and resistance to dental caries. J. D. Res. 17:393 (Oct.) 1938.

6. American Association for the Advancement of Science, Dental Caries and Fluorine. Washington: American Association for Advancement of Science, 1946, p. 53.

7. McClure, F. J., Fluoride domestic water and systemic effects. Pub. Health Rep. 59:1543 (Dec.) 1944.

fession would have detected any systemic involvement if it had occurred. All evidence pointed to the fact that artificially added fluorides produced exactly the same results as natural fluoride water.

PUBLIC HEALTH APPLICATION

The question then arose, "What are we going to do with this mass of information?" Can and should this information be utilized for the betterment of public health? The Wisconsin State Dental Society considered this subject so important that it appointed a Fluorine Study Committee in 1943. This committee, under the chairmanship of Dr. T. A. Hardgrove, Fond du Lac, not only reviewed the literature critically, but went into those areas of Wisconsin where public water supplies naturally contained appreciable amounts of fluorides to personally conduct their own experimentations and evaluations. As a result of their studies, this resolution was adopted by the Wisconsin State Dental Society in 1945:

> Whereas: We the members of the Wisconsin State Dental Society's Fluorine Committee, convinced that the overwhelming weight of the evidence now precludes any doubt that a drinking water supply containing a concentration of one part per million of fluorine, as fluorides, inhibits dental decay,
>
> And whereas: All evidence shows that the optimum of one part per million of fluorine, as fluorides, in water has produced no untoward results,
>
> We therefore recommend that public water supplies deficient in fluorides have their concentration raised to one part per million of fluorine, as fluorides, to inhibit dental decay, providing that such addition is under dental, medical, engineering, and public health control.

The Wisconsin State Board of Health, composed of eight prominent physicians, made a similar study of the relationship of fluorides to dental caries and, in 1945, passed a resolution encouraging cities to add fluorides, not to exceed 1 ppm, to their public water supplies. In 1947, this resolution was amended to permit a 1.5 ppm maximum, as:

> In the light of additional data and information now available relative to the addition of fluorine to public drinking water supplies as a means of reducing the incidence of caries in teeth in children, the Board hereby restates its policy re fluorination of city water supplies as follows:
>
> Controlled fluorination of drinking water appears to give promise of a substantial reduction in tooth decay to children whose mothers were ingesting protective amounts of fluorine during pregnancy and who, as infants and children, have continued to use water containing 1 to 1½ parts per million of fluorine during their first twelve years of life, and therefore the Board is in accord with having cities set up fluorination projects where acceptable controls are established and maintained.

Following these official actions, the city of Sheboygan passed an ordinance requiring the addition of fluorides, not to exceed 1 ppm, to its public water supply. This was begun in February 1946, with the addition of sodium fluoride by means of a dry feeder. A prefluoridization dental survey was done on all kindergarten, fourth, seventh, eighth and ninth grade children. This survey was to be repeated annually on the same age groups.

From an engineering standpoint, the addition of the exact amount of fluorides necessary, so as to maintain 1 ppm in the water, did not present any difficulties, and at no time has the fluoride content varied over one tenth of 1 ppm. The total cost of this program has varied from 9 to 11 cents per capita annually.

RESULTS

Now it remained to determine for how long a period fluorides would have to be added to a public water supply before any substantial reduction in decay rates in the population could be shown. As mentioned before, annual surveys were to be done on the kindergarten, fourth, seventh, eighth and ninth grades. Each

annual survey showed a decrease in decay rates. The 1948 survey, following 33 months of adding fluorides, showed a 28 per cent reduction in def rate of the deciduous teeth, and an 18 per cent reduction in DMF rate of the permanent teeth. The 1949 survey, following 44 months of fluoridization, showed that the def rate for deciduous teeth decreased from 4.80 to 2.90, a decrease of 39.6 per cent. The percentage of kindergarten children who had no caries attack experience rose from 20.4 per cent in 1945 to 37.3 per cent in 1949 (82.8 per cent). The DMF for the fourth grade was reduced 24 per cent and the DMF for the seventh, eighth and ninth grades showed a reduction of 18 per cent.

These figures compare favorably with the recent official report from Brantford, Ontario,[8] where, following 40 months of adding fluorides, a 45 per cent decrease in decay rates of the deciduous teeth, and a 22 per cent reduction in decay rates of the permanent teeth were found. (Since this paper was presented, Newburgh, New York,[9] has reported a 30 per cent reduction in DMF rates of permanent teeth; Marshall, Texas,[10] has reported a 23 per cent reduction in DMF rates of the permanent teeth and a 45 per cent reduction in def rate of the deciduous teeth, following three years of water fluoridization in both cities.)

It should be noted that while 1 ppm of fluorine gives the maximum protection to permanent teeth, it does not give the maximum protection to the deciduous teeth.[11]

These studies and reports indicate that whenever the fluoride ion is present in drinking water, either by being artificially added or as supplied by nature, a noticeable decrease in dental decay rates is found. It is well known that in order to obtain the maximum amount of protection against the incidence of dental caries (60 per cent), the individual must consume water containing fluoride from birth on through the twelfth year. However, at the end of a three-year period enough improvement can be demonstrated to justify the conclusion that the same results are obtained by water containing artificially added fluoride as by water containing natural fluoride. Soluble fluorides are absorbed in the gastrointestinal tract and carried to the developing tooth by the body fluids. It is not fluoride salt which is incorporated into the tooth structure to form a fluorapatite—it is the fluoride ion. The source of this fluoride ion can be any soluble fluoride, such as calcium fluoride, sodium fluoride, magnesium fluoride, sodium silico fluoride, hydrofluosilicic acid, or hydrofluoric acid. In Wisconsin, fluorides are being added to public water supplies in various ways; namely, sodium fluoride (both wet and dry), hydrofluoric acid, hydrofluosilicic acid and sodium silico fluoride. All of these different methods have proved to be practical, dependable and economical. The method of choice depends upon the engineering problems involved—size of the city, source or sources of water, number of installations required, and so forth. Undoubtedly, large cities having a centralized filtration plant will use sodium silico fluoride, as the costs can be cut from 15 cents per capita annually using sodium fluoride to 5 cents per capital annually. This, plus the fact that there are unlimited supplies of sodium silico fluoride available, will influence their decision.

From the preceding discussion, certain basic facts stand out: (1) fluorides naturally present in public water supplies reduce the incidence of dental caries about

8. Hutton, W. L., Personal communication, January, 1949.

9. Ast, David B., Dental findings after three years of water fluoridation. Presented before A.P.H.A. Meeting, October, 1949.

10. Taylor, Edward, Fluorination of public water supplies. Publication of Texas State Department of Health, 1949.

11. Bull, F. A., Water fluorination proves its value. Dental Digest 55:257 (June) 1949.

60 per cent; (2) artificial fluorides can be safely and economically added to a public water supply; (3) the action of artificially added fluorides in a public water supply is exactly the same as that of natural fluorides in the water in reducing the incidence of dental caries.

PUBLIC HEALTH SIGNIFICANCE

The question now arises as to what significance, if any, these observations have to the profession and to the public. The present manpower in the dental profession is sufficient to cope with less than one third of the existing dental caries incidence in the population. In other words, two thirds of the citizens go without dental care under existing conditions, even though they seek that care and have the money to pay for it. Certainly such a condition suggests the dire need of mass control or prevention of dental caries.

The question now arises, "Is the evidence for the fluoridization of public water supplies sufficiently conclusive to warrant its general recommendation to the public?" Like all questions pertaining to public health, there are two viewpoints. One group believes that the evidence is sufficiently conclusive to make this recommendation. The Wisconsin State Dental Society and the Wisconsin State Board of Health, the Colorado State Dental Society and the Colorado State Board of Health, and several research workers support this viewpoint and have been making this recommendation for some years. The other viewpoint is that, while all the evidence for the artificial fluoridization of public water supplies looks good, this evidence is presumptive, and scientific skepticism should be applied to all of this data and no recommendation be given to the public until this evidence is conclusive.

In all fairness, it must be stated that scientific skepticism is a healthy condition. However, this skepticism must be based on logical deductions. When there is overwhelming epidemiologic evidence to support any public health measure, skepticism not founded on logical bases should not constitute a valid reason for withholding that measure from the public. The history of public health is filled with examples of great harm done to the public because skepticism was maintained long after it had ceased to be scientific or logical. As stated by Dr. Krumbiegel,[12] chief health officer of the city of Milwaukee:

> In the past, millions of people have suffered from various preventable diseases and millions of people have died because unwarranted professional skepticism was maintained too long after adequate epidemiologic data had demonstrated that those diseases could be prevented or controlled.

RESISTANCE TO PUBLIC HEALTH MEASURES

The same arguments are being presented today against fluoridization of public water supplies that were presented many years ago against such public health programs as chlorination of drinking water, iodine in goiter prevention, use of silver nitrate in the eyes of the newborn for prevention of gonorrheal blindness, and so forth.

The first argument against iodine for goiter prevention was that artificially introduced iodine would not produce the same results as natural or food iodine in goiter prevention. The next argument against this program was that the cumulative effect would produce a toxic condition much more serious than simple goiter. The final argument was that all the evidence for such a program was presumptive and that no recommendation should be made to the public until the evidence was "conclusive." These same arguments which have been used

12. Krumbiegel, E. R., The public health aspects of fluorination of public water supplies. Read before Wisconsin State Dental Society, April, 1949.

against all public health programs for the past half century are now being revived against the present public health program of water fluoridization.

If the present evidence for water fluoridization is not sufficient to warrant approval, then none of these public health programs should have been approved. The present evidence for water fluoridization is a great deal more conclusive than that of any of these important public health measures at the time of their introduction.

PUBLIC HEALTH ACTION

In Wisconsin, the decision on fluoridization of public water supplies has been made in the affirmative. The citizens of our state are emphatically being advised by the Wisconsin State Dental Society and the Wisconsin State Board of Health to add fluorides to their public water supplies immediately. These same people are being told that their future citizens can have a DMF of 3 at the age of 14 years if they adopt this public health measure, instead of their present DMF of 10; that they can have a DMF of 9 at 40 years of age, instead of their present DMF of 21. In other words, it is up to the people themselves to decide the dental decay rates of the future, and the cost of the entire program need not exceed 10 cents per capita annually.

In April of 1949, the Fluorine Study Committee of the Wisconsin State Dental Society passed a resolution condemning fluoride-deficient public water supplies as unfit for young children to drink, from the standpoint of dental health.

AT A LOCAL LEVEL

The result of bringing this information to the people of Wisconsin has been that,

Wisconsin cities that have approved fluoridization program

Cities now fluoridating public water supplies	
Antigo	Middleton
Ashland	Mukwonago
Baraboo	Neenah
Beloit	Oregon
Bloomer	Oshkosh
Edgar	Racine
Elkhorn	Reedsburg
Evansville	Rhinelander
Fort Atkinson	Richland Center
Hartford	Sheboygan
Janesville	Soldiers Grove
Madison	Stevens Point
Mayville	Stoughton
	Sun Prairie

Cities that have approved fluoridization—equipment being installed		
Appleton	Keshena	Port Washington
Beaver Dam	Lake Mills	Prairie du Sac
Boscobel	Lodi	Ripon
Columbus	Mazomonie	Shawano
Darlington	Mellen	South Milwaukee
Edgerton	Menasha	Tomahawk
Fennimore	Menomonee Falls	Watertown
Fond du Lac	Milwaukee	Waupun
Glidden	Minocqua	Wausau
Hurley	Neopit	West Bend
Johnson Creek	Phillips	Westby
Kenosha	Port Edwards	Weyauwega
		Wisconsin Rapids

at the present time, 80 per cent of the population living in communities having a public water supply are either adding fluorides to their water or are in the process of installing the equipment to do so. The accompanying Table lists Wisconsin cities that have undertaken this program.

The Wisconsin legislature in 1949 considered the fluoridization of public water supplies of sufficient importance that it enacted legislation whereby the cost of fluoridization can be included in the water rate of a community.

LIMITATIONS

From a public health viewpoint, the limitations of a program of the fluoridization of public water supplies are: (1) it does not help the rural population, which in Wisconsin comprises 42 per cent of the total population; (2) fluoridization of public water supplies is not a cure-all for dental caries control and prevention. Those born and raised in a community which adds fluorides to the water will still have one third of their present dental caries incidence. They will still have need for a good dental health education program in all its various phases.

SUMMARY

1. Natural fluorides in a public water supply prevent about two thirds of the incidence of dental caries in those consuming a constant supply of the fluoridated water.

2. The fluoride ion which has been added to water acts in exactly the same manner to protect the teeth against dental caries as does the natural fluoride ion in water.

3. The artificial addition of fluorides to a public water supply is a simple engineering problem and can easily be controlled to one tenth of one ppm. The approximate cost of fluoridating a public water supply is 10 cents per capita annually.

4. Following 44 months of fluoridization of the public water supply at Sheboygan, Wisconsin, the incidence of dental decay was reduced 39.6 per cent in deciduous teeth, 24.4 per cent in permanent teeth in the 9 to 10 year age group and 18 per cent in the 12 to 14 year age group. Brantford, Ontario, Newburgh, New York, and Marshall, Texas, are showing similar reductions in decay rates following fluoridization of their public water supplies.

5. The evidence is now sufficiently conclusive that the recommendation should be made that all public water supplies deficient in fluorides should have their fluoride content increased to approximately 1 ppm immediately.

6. The Wisconsin State Dental Society and the Wisconsin State Board of Health have recommended a program of water fluoridization since 1945.

7. Eighty per cent of the urban population in Wisconsin has adopted this program.

8. A program of dental health education is still needed in communities adopting a fluoridization program.

Great Men • From time to time there appear on the earth rare and delightful men of resplendent virtue whose eminent qualities shed a wonderful luster about them. They are like those marvelous stars, of the origin of which we know nothing, while we know still less what will become of them after they have disappeared. They have neither forebears nor descendants; they are a race in themselves. *La Bruyere.*

Dentistry for the cerebral palsied

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The difficulties attendant on the rendering of dental service to certain of the cerebral palsied are not due to any marked variations from normal or average normal dentition. If there is any variation, it is likely to be on the side of being better than the average normal dentitions.

It is difficult to find a satisfactory answer to the paradox of these observations. Often cerebral palsied children are incapable of any of the dental hygiene practices to which is ascribed a certain degree of caries prevention. They cannot brush their teeth; some cannot even rinse out their mouths. The possibility has been suggested that dietary factors play an important role and are the basis of the relative freedom from caries. However, dietary factors vary with economic status, and the relatively high standard of living of some of the children examined at the Children's Rehabilitation Institute does not necessarily accompany a comprehension of, or an inclination to follow, established nutritional regimens.

It is also beyond probability that such a large percentage of children should, by sheer chance, be the beneficiaries of fluorinated water therapy, since they come from all over the United States and all over the world. Indeed many of them come from areas where fluorine in water is known to be negligible or completely lacking. Finally, the fluorine theory fails to hold because these children are so often completely caries-free. It is known that only an average 60 per cent reduction in caries incidence is attributable to naturally fluorinated water.

These observations are not the basis for any generalization that there are more caries immune children among the cerebral palsied than among the physically normal. However, should they be generally supported, research would be justified to determine why such a large number of the cerebral palsied seem blessed by relative caries immunity.

Cerebral palsies in general result from prenatal or postnatal injuries, infections or faulty development of brain or nerve tissues in areas having to do with motor and sensory impulses. The areas most commonly involved (sometimes singly and sometimes in combination one with the other) are the brain's motor cortex, basal ganglia and cerebellum, the anterior or ventral horn of the spinal cord and, somewhat less frequently, the sensory area of the brain and cord. That the areas affected are those of motor reaction and sensory perception is important to an understanding, not only that

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muscular control is most often impaired, but also that the impairment is functional and not always, in the generally understood sense, mental.

This latter fact is of the utmost importance in dealing with dental conditions among the cerebral palsied. Many dental practitioners erroneously believe that work with the cerebral palsied is always work with mentally subnormal children. Nothing could be further from the truth. That some of the cerebral palsied patients have been educationally retarded is true and naturally so. Their physical handicap has been an obstacle to the rapidity of their education as it is rated by scholastic progress in formal schooling. Mentally they are usually normal, sometimes abnormal, occasionally subnormal. Hence in dealing with them a dentist ordinarily must respect them as mentally normal, open to reason according to age, subject to normal reactions, sensitive to discomfort in keeping with their age, and capable of giving subjective aid in diagnosis. In short, one is not dealing with cases of feeble-mindedness.

TYPES OF CEREBRAL PALSY

There are many classifications of types of cerebral palsy. A common designation gives three types; namely, spastic paralysis, athetosis and ataxia. To these, some add rigidity and tremors as additional classes. Since the last named two classes are quite commonly associated with one or more of the other classifications, this discussion will be limited to spasticity, athetosis and ataxia. The designation of the resulting muscular involvement is common to all three: monoplegia, the involvement of one extremity; paraplegia, the involvement of both lower extremities; diplegia, quadriplegia and tetraplegia, the involvement to varying degrees of both upper and lower extremities. Involvement of the head and neck is common in cases of involvement of the arms and shoulders.

Spastic paralysis is believed to be due to defects in the brain's motor cortex or pyramidal tracts. The defective tissue results in completely or partially diminished ability to control muscular movements. Mental effort toward control results in greater lack of control. Lack of muscular control results in either the flexing of muscles when contraction is desired or the contracting of muscles where extension is wanted. Since all muscles are not necessarily involved, the result may be a series of involuntary contractions and relaxations of muscles. Lack of control causes many falls in which injuries are sustained, often dental.

Athetosis results from defects in the brain's basal ganglia or extrapyramidal tract. Tremor is quite commonly associated with athetosis. The condition, broadly, is characterized by constant involuntary muscular movement. These movements may be exaggerated, however, by voluntary effort to control muscular movement. An important fact about athetoids is that their muscular movements cease when they are asleep. This is not true of spastic paralysis.

Ataxia is the least common of the forms of cerebral palsy. It is due to lesions or defects in the cerebellum. Sensation is particularly involved. Asleep, there is no involuntary motion or muscle tension.

So much for the main general types of cerebral palsy. Since all of them may in one way or another influence the ease or difficulty with which dental service may be rendered, our discussion will largely overlook any specificity as to the type of palsy. In a few case histories included in this paper, some reference will be made to specific types as they influence the dental condition.

DENTAL CONDITIONS

Dental conditions affecting the palsied are largely those encountered in any similar group of physically nonhandicapped children. Possibly there is a some-

what higher percentage of accident cases —of fractured incisors, for example. The needed dental attention calls for periodic examinations, prophylaxes, cavity preparation, filling insertion, and occasionally bridgework. Treatment of periodontal conditions, mostly simple gingivitis, constitutes a particularly large part of the needed dental care. Extractions have been limited for the most part to the removal of deciduous teeth. It is preferable to refer more difficult extractions or multiple extractions to specialists able to provide general anesthesia. Following is a brief discussion of each of these phases of dental care.

DENTAL SERVICE

Examination • The difficulties attending dental care for the cerebral palsied first manifest themselves in making examinations. Here, as in other phases of care, there is need for the utmost patience. To detect the highly essential details of existing dental conditions is a time-consuming process. The clinical examination is made particularly difficult if the musculature of the head, neck or upper extremities is involved. The convulsive jerking tends repeatedly to displace the mouth mirror and the explorer. In cases of rigidity there is apt to be involuntary closing of the mouth with attendant difficulty to the examiner in scanning the occlusal, buccal and lingual surfaces. Even when momentary control permits the patient to relax and the jaws to open, there is the constant threat of a sudden, forceful muscular contraction that brings the teeth together with abruptness, which is nearly impossible to anticipate.

Digital dexterity in handling mirror and explorer is not always sufficient to offset the danger of bitten fingers, broken mirrors or misdirected explorers. One learns by experience to avoid the placing of fingers between the upper and lower teeth. One should choose locations to place the fingers, such as posterior to the first or second permanent molars or areas where exfoliation gives an area of relative safety. Mouth mirrors offer a particular hazard. The noise of a glass mirror being crunched to bits is never forgotten; it leads to the development of a technic that will avoid the placement of a mirror between possibly occluding teeth. An even better solution to this problem is to use mirrors made of highly polished steel. If they are not obtainable on the market they may be improvised. The use of explorers likewise constitutes a hazard in the mouth of a child unable to control muscle movement. If they are to serve in the detection of incipient lesions they must, of necessity, be sharp. Consequently, they are a constant source of danger to soft tissues. The only safeguard in their use is painstaking care and digital dexterity.

There are difficulties in roentgenographic examination also. Film placement constitutes an initial problem, its retention another problem and movement while the picture is being taken a third. Some pictures resemble, through no fault of the operator, something akin to a depiction of the orthodontic movement of a tooth through alveolar bone tissue. Unfortunately, it is not possible to use roentgenography with the same degree of diagnostic assistance as in the mouths of normal patients.

One more word about examinations. If ever there is justification for frequent examinations it is with the cerebral palsied. Detection of lesions in incipient stages is so essential that failure to examine at frequent intervals is only multiplying future problems.

Cavity Preparation • Cavity preparation is the chief problem in dental treatment of the cerebral palsied. A crying child offers no problem other than one of nerves and morale. If the child's mouth is open one can operate. But if ever one is "stymied" it is when the patient's teeth are clenched in occlusion or, the jaw or

the head may be jerked convulsively at any moment or, the wide open jaws may suddenly close in occlusion. Frankly, I admit I know of no answer to this problem. I have prepared cavities I didn't believe possible to achieve although others have left much to be desired. In some instances the spastic condition was so severe that it was impossible to operate.

However, these experiences have taught me a few things. When permissible, a degree of relaxation of muscles may be obtained through premedication with one or another of the sedatives or hypnotics, although they are not always effective. Their use is sometimes contraindicated. On occasion their effectiveness is suddenly dissipated at the wrong moment. Limited as its use may be, premedication under a physician's direction has its place in dental care for the cerebral palsied.

The use of mouth props suggests itself as a means of overcoming occlusal rigidities, but they are not a complete solution. Repeated convulsive lateral excursions of the mandible tend to displace the prop. Unless it is placed so as to hold the teeth apart to a maximum distance, the additional opening together with convulsive tongue and cheek muscles will dislodge it. Finally the very nature of the restraint tends to make more violent the muscular movements of other body parts, thus offsetting the increased ease of accessibility. Probably the best mouth prop is one with scissorlike handles along the outside of the cheek—the handles permitting an assistant at the chair to exercise some degree of steadiness to the prop.

Small burs are sometimes necessary but should be used as seldom as possible. One convulsive jerk of the head and the small bur may bury itself in the tooth pulp or in soft tissue. Large burs are less likely to do so. The largest bur consistent with the nature of the cavity to be prepared is the one to use. Because I have greater dexterity in the use of burs than in other instruments such as chisels, hatchets and hoes I use burs and stones to finish cavity margins and walls. Large burs and large sharp excavators, when possible, small burs and small sharp excavators when necessary, are my cavity preparation armamentarium.

In treating the cerebral palsied it is not always easy to determine whether all the caries has been removed. Hence my practice of the use of silver nitrate before placing a cavity lining and filling. No one decries the abuse of silver nitrate more than I. At best it is only an adjunct to preventive dental practice. For the trace of caries inadvertently left in the floor of a posterior tooth cavity; or for the carious deciduous teeth of a cerebral palsied child in whom rigidity, for example, makes cavity preparation impossible; or in permanent teeth where like circumstances make satisfactory cavity preparation impossible, the use of silver nitrate is indicated.

Filling Materials • As for filling materials, only plastic materials, alloys, cements and silicates should be used. Among the cerebral palsied I have encountered but one with gold fillings. I marvel at the patience of the dentist who restored Patty's two fractured upper central incisors with gold three quarter crowns and labial silicate windows. Unfortunately, Patty has difficulty in maintaining her erect balance and when she falls she always seems to knock out one or both inlays. We have developed a game; if Patty doesn't fall for a certain period of time I promise the next recementation will be gratis.

Bridgework and Dentures • Removable bridgework or dentures seem completely contraindicated for a patient with cerebral palsy involvement of the head and neck. Even those with paraplegic involvement have potentialities for falling that make them poor risks for removable dental appliances. Fixed bridgework presents the problem of preparation of the abut-

ments. There are cases where for numerous reasons fixed bridgework, in spite of difficulties, must be made. J.K. is a case in point.

J.K. is an athetoid boy in his late teens. There is some involvement of his head and neck and there is extensive involvement of his legs. He is constantly falling although marked improvement in ability to walk has developed recently. When he falls he seems to fall squarely on his face. Prior to his coming to Children's Rehabilitation Institute he had lost the upper right lateral and both central incisors. Some dentist, again with an ingenuity that gives pride to our profession, had devised a fixed bridge without grinding the abutting right cuspid or left lateral incisor. The abutments were encircled with broad bands of gold on their gingival thirds. The snugness of these bands was remarkable. Pontics replaced the three missing teeth. One night J.K., in trying to get out of bed, fell on the bridge, which was literally driven up into the alveolus until the pontics were embedded in the bone. The abutting left lateral incisor was fractured at the root. On an emergency call the bridge was removed. Later x-rays were taken and the lateral incisor was extracted. The bridge, of course, was useless. Still later a dental consultant made J.K. a new bridge which serves better than the original.

Periodontal Conditions • Inability to brush their teeth themselves accounts for the high incidence of gingivitis. That this condition is not more severe in the patients at the Children's Rehabilitation Institute is a tribute to the care given by housemothers. Brushing the teeth of a physically normal child is no mean task; brushing the teeth and stimulating the soft tissues in mouths of children handicapped by lack of muscular control, increases that task immensely. There are, of course, some instances of marked gum inflammation. Treatment consists of the usual palliative medications and asking the patient's housemother to try a little harder in her mouth cleansing task. Occasionally conditions attributable to vitamin C deficiency are encountered. The result obtained from prescribing vitamin C is remarkable.

The worst gum disorder seen has us all baffled. F.C., a teen age boy, has proliferating gum tissue for all the world like that resulting from dilantin therapy. But F.C. is not an epileptic, has never, according to a very thorough record, taken dilantin nor in fact any other medicines such as the barbiturates (known sometimes to cause abnormal proliferation of gum tissue). The tissues do not respond to any topical medication. Cautery has not been tried, it having been reported that previous effort at excision of the excessive tissues resulted in almost immediate recurrence. There is no reason, of course, for attributing the gum condition to the palsy.

Extractions • Extractions are best referred to those equipped with facilities for general anesthesia. Simple extractions of deciduous teeth have been performed, the greatest difficulty, of course, being the matter of anesthesia. Injections for nerve-block (for either extractions or operative procedures) are best avoided, and reliance placed on infiltration around the offending tooth. Even these injections present difficulties when, to the customary flinching from the hypodermic needle, there is added the involuntary muscular contraction and relaxation. One feels relieved when a penetration is made at the right point and hopes a convulsive jerk will not dislodge or break the needle.

Tooth Abrasion • One dental condition quite often found is occlusal and incisal abrasion of the teeth associated with the cases of "rigidity." In numerous instances the deciduous teeth are found ground down literally to the gum margins. In one older patient, Y.R., there is evidence of a slow abrasion, particularly of the

molar and bicuspid cusps. As yet the condition has not progressed to a point making the placement of onlays advisable. The patient is aware of the condition and of the probable subsequent need of some method of restoring the abraded surfaces and, it is hoped, deterring further abrasion.

It is fully recognized that the foregoing description of dental service contains little or nothing that is markedly at variance with routine dental practice. Indeed, this is natural for the dental abnormalities needing attention in the cerebral palsied do not vary greatly from those of non-handicapped children. When variations in methods have been suggested they have been directed toward two goals; first, correcting the condition to the best of one's ability and, second, doing so with a minimum of danger to the patient.

Adjuncts to Treatment • There are a few other points that may aid in treating the cerebral palsied—things not dental in a sense, but adjuncts to dental treatment. For example, many of these patients have difficulty in maintaining themselves upright in a dental chair. To offset this inability two things may be done. First, the front edge of the dental chair seat may be elevated several inches, with somewhat the same effect as a garden or beach chair. This prevents slipping forward. Second, a broad canvas band may be passed around the patient's abdomen or under the arms and tied behind the chair.

Attempt should not be made to control flaying arms or leg movements by tying them or by tightly clamping them. Such an attempt would be futile, since the restraint would serve as an irritant that would result in increased involuntary muscular movement. As assistant to hold the arms gently but firmly is essential, particularly if the patient is a quadriplegic. Head movements are particular problems. It has been suggested that some type of clamp might be affixed to the chair head-rest as a control of head movements. This does not seem practical. A better control is the crotch of the elbow. It does not control all movement but tends to minimize jerking and, more important, provides for anticipation of movement and its direction. All body movements make for difficulty to the operator. I know of no control for these. Leg movements have the added disadvantage of sometimes striking the operator. In a school or hospital it might be practicable to devise a cage fitting over the lower part of the dental chair. In private practice the same practicality might not attend.

One more important service should be mentioned. If preventive treatment such as fluoride therapy[1] or impregnation against caries is ever indicated it most certainly is in the mouths of the cerebral palsied. Anything known to minimize future dental disorders is indicated. I am well acquainted with fluoride therapy and know that it may be rendered this type of patient; not always with ease, not always with complete results—but it can be done. I am less well acquainted with impregnation technics but I am sure some cerebral palsy patients could be recipients of this type of treatment.

Dental practice in general and most particularly among the cerebral palsied has one priceless requirement: patience.

The dentist with cerebral palsied patients who seeks a greater understanding of the problem will find it in the recently published material by Winthrop M. Phelps.[2]

R.F.D. 8, York Road

1. Pelton, W. J., and Wisan, J. M., Dentistry in Public Health. Philadelphia: W. B. Saunders Company, 1949. Ch. 8. Fluorine: water-borne fluorides and dental health, by H. Trendley Dean p. 136; Ch. 9, Fluorine: Systemic, oral environmental, experimental and control aspects, by Francis A. Arnold, Jr., p. 163.

2. Nelson, Waldo E., editor, Textbook of Pediatrics, ed 4 (Mitchell-Nelson). Philadelphia: W. B. Saunders Company, 1946. The cerebral palsies, by Winthrop M. Phelps, p. 1111.

The use of the toothbrush in the treatment of periodontitis

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The objectives of any system of treatment for periodontal disturbances are five:

1. To cause tissues supporting the teeth to return to a state of health. After successful treatment the gingival tissues should be a pale coral pink with a firm, well-stippled "orange peel" surface and should be resistant and insensitive to trauma. The teeth should be firmly held in position and there should be no suppuration. To accomplish this objective, all forms of local irritants must be removed or corrected.

2. To perform all dental operations which will help maintain supporting tissues in a healthy condition. To accomplish this, the treatment should include occlusal equilibration, correction of improper contact areas, contouring of poor dental restorations, and perhaps a gingivectomy to reduce pockets that are so deep that the patient cannot maintain oral health.

3. When necessary, to correct the diet and all systemic conditions which tend to interfere with the health of the oral tissue.

4. To teach patients the importance of and the technics for maintaining the supporting tissues of the teeth in a healthy condition by adequate home care.

5. To convince patients of the importance of regular and frequent follow-up examinations.

Any treatment for periodontitis cannot be considered successful if, after a few weeks, the gingival tissue returns to an inflammatory condition with the supporting tissues tender and hyperemic and the teeth bathed in suppuration. Adequate treatment must include procedures which will maintain health for months and, with periodic help from a dentist, for years.

Maintenance of health depends almost entirely upon removal or correction of the causes of disease. If supragingival calculus is not completely removed, if food impaction continues, if diet is inadequate, or if any local or systemic factor which lowers the resistance of the periodontium remains uncorrected, healthy oral structures cannot be maintained. Even if all known etiologic factors are removed but oral care is then neglected by the patient, in a few months the oral condition will be unsatisfactory. Most periodontists agree that proper toothbrush technic is an effective, simple and inexpensive aid in maintaining the oral cleanliness so essential to oral health. This paper is limited to a discussion of the use of a toothbrush in periodontitis, which is an important part of the fourth principle mentioned above.

Dean, Indiana University School of Dentistry.

GINGIVAL MASSAGE

Some periodontists (Lyons,[1,2] Loeb,[3] Zisken[4]) have questioned the value of gingival massage in the treatment of periodontitis, pointing out that acceptable scientific evidence of it is not available. It is true that massage with a toothbrush can be harmful if it is improperly performed, if local irritants are present, or if an acute inflammation exists. Toothbrushing is contraindicated in cases of acute gingivitis (for example, acute necrotizing gingivitis) and acute periodontal abscess. The toothbrush must be used with care in cases of desquamative or atrophic gingivitis or severe gingivitis due to a dietary deficiency or a blood dyscrasia. Flabby gingival tissue can be cut to ribbons by harsh brushing with a stiff bristle brush. Even healthy gingivae can be so irritated by improper use of too harsh a brush that gingivitis or recession can result.

Gingival massage will be ineffective, if not actually harmful, if performed in a mouth in which subgingival calculus is present. Pressing the gingival tissues against a tooth surface with a spicule of calculus on it is about as desirable as pushing the tissues against coarse sandpaper. However, after all local and systemic factors causing gingivitis, or periodontitis, have been corrected, gentle massage will hasten the return of gingival tissues to health and will tend to make them more resistant to future irritants. The following four reasons are offered to defend the view that gingival massage is desirable:

1. The effects of massage to other parts of the body are well known. According to Kovacs:[5]

> Chronic inflammatory changes in the tissues caused by trauma or infections, and their after-effects, local edema, indurations and infiltrations and extravasations of blood are favorably influenced by appropriate massage movements. This is due to the speeding up of the movements of the venous and lymphatic circulation, to the pushing effect on the extravasated blood and to the mechanical stretching of the strings and bands of connective and fibrous tissue.

Although he does not mention the oral mucous membranes, Kovacs[5] states:

> Upon the skin massage exerts a mechanical stimulation, its immediate effect being a dilatation of the capillaries, accompanied by a subjective feeling of warmth. This hyperemia is only temporary, disappearing as soon as the reaction of the capillary vessels ceases. Massage exerts a cleansing effect on the superficial layers of the epidermis. In the subcutaneous tissue massage also promotes the movement of fluids and loosens the elastic layer, thus making the skin more firm. The blood vessels are effectively emptied by massage.

This is true in the gingiva also, for a definite blanching occurs under pressure of the toothbrush. Kovacs continues:

> It has been shown that after massage there is an increase of red blood cells in the superficial vessels amounting to 40 to 50 per cent. Thus the links in the chain of physiological phenomena produced by massage are arterial stimulation, active hyperemia, more active nutrition, secretion, excretion and absorption, in fact more rapid and more thorough metabolism, and increased functional activity in the part or parts subjected to massage.

Krusen[6] writes that experiments on the capillary circulation in the ear of a rabbit lead to the conclusion that:

> Massage thus was accompanied or followed by an increased interchange of substances between the blood stream and tissue cells, with an altered and presumably improved metabolism of tissues.

1. Lyons, Harry. Gingival massage. J. Periodont. 19:71 (April) 1948.

2. Lyons, Harry. Fiction and facts in periodontology. J. Periodont. 39:513 (Nov.) 1949.

3. Loeb, Virgil. Gingival massage. J. Periodont. 19:70 (April) 1948.

4. Smith, T. Sydney. Principles of general surgery as applied to constructive treatment of paradental disease. J. California D. A. 19:2 (Jan.-Feb.), 33 (Mar.-April) 1943.

5. Kovacs, Richard. A Manual of Physical Therapy. Philadelphia: Lea & Febiger, 1946, p. 226.

6. Krusen, F. H., Physical Medicine. Philadelphia: W. B. Saunders Company, 1941, p. 527.

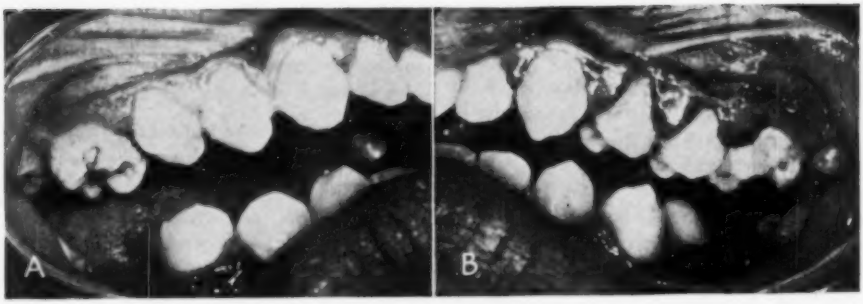


Fig. 1 • A, Right side and B, left side of mouth of man 23 years of age who had been unable to use left side of mouth for several weeks because of acute alveolar abscess. Gingivae in upper right quadrant (A) are fairly normal, showing only slight chronic inflammatory reaction in two interproximal areas. Note presence of chronic inflammatory hyperplastic gingivitis on left side of mouth (B). Tissues were tender and bled easily

Such changes undoubtedly occur in the gingival tissues following massage, and result in a firmer, more resistant gingiva.

2. It has been shown that gentle massage will cause keratinization of the epithelial layer of the gingiva in man and in dogs.[7] Robinson and Kitchin[8] concluded from their controlled studies that brushing the gingiva increased keratinization of the surface epithelium. It is probable that increased keratinization will result in an increased resistance to trauma by the gingival tissues, and hence is desirable.

3. Clinical observations of the gingivae of patients who have received adequate gingival massage as compared with the gingivae of patients in whom massage has been poor indicate that gentle massage is helpful. As Lyons[2] had stated, this represents an opinion, not a scientifically proved fact, but many observations, coupled with the expressed opinions of most periodontists, lead to the conclusion that gingival massage is desirable. Function is important in the maintenance of oral health and the toothbrush offers the best substitute known for vigorous mastication. Figure 1 illustrates an instance of a 23 year old man who for several weeks had been unable to use the left side of the mouth because of an acute alveolar abscess followed by an extraction and prolonged postoperative pain in the lower molar area. A severe unilateral gingivitis had resulted from nonfunction. Treatment included restoration of normal function to the left quadrant of the mouth.

4. At least two clinical research experiments suggest that gingival massage is beneficial. Beube[9] has reported an observation of patients with marginal gingivitis apparently due to poor home care and accumulated irritants. Teeth were scaled daily for several weeks. One side of the mouth was brushed in the patient's usual manner, and the opposite side was brushed using a technic which cleaned and massaged more adequately. The inflammation disappeared on the side that was well brushed but persisted on the poorly brushed side.

Recently a group of dental students at Indiana University were asked to brush

7. Kitchin, Paul C., and Graham, W. C., Sodium alkyl sulfate as a detergent in toothpaste. J.A.D.A. 24:736 (May) 1937.

8. Robinson, H. B. G., and Kitchin, P. C., The effect of massage with the toothbrush on keratinization of the gingivae. Oral Surg., Oral Med., & Oral Path. 1:1042 (Nov.) 1948.

9. Beube, Frank E., Gingival massage. J. Periodont. 19:66 (Apr.) 1948.

on only one side of their mouths for a period of two weeks. At the end of that time their mouths were examined: the majority showed no difference between the brushed and unbrushed sides. However, several complained of a gingivitis on the unbrushed side. Figure 2 illustrates the case that showed the most striking difference. The patient reported that shortly after the experiment began, the teeth on the unbrushed side felt dirty as though covered with a thin layer of felt. Gingival tissues became sensitive and bled when that side was used in mastication. At the end of two weeks (Fig. 2A) the results were striking. For the next two weeks, the patient massaged the gingival tissues and brushed the teeth on the other side, ignoring the side previously brushed. After two weeks (Fig. 2B), gingivitis was again present on the unbrushed side. The patient then brushed on both sides of the mouth and the gingivitis disappeared completely. The experiment was repeated and the same results obtained, thus demonstrating that in this patient a gingivitis could be produced at will by inadequate toothbrushing. No other treatment was used in the experiment.

Many patients have healthy gingival tissues without brushing their teeth. However, many in the adult age group need the mechanical aid of a toothbrush to keep their gingival tissues in a healthy condition. Modern diet does not furnish gingivae with the scrubbing action of mastication. Massage must therefore be desirable, and the toothbrush is the most practical way to furnish it.

AIMS OF TOOTHBRUSHING

Toothbrushing aids in the maintenance of oral cleanliness; the latter helps in the prevention of periodontitis and perhaps of dental caries, and certainly improves the comfort and esthetics of the oral cavity.

Specifically, the toothbrushing technic should: (1) remove from the teeth all food debris, accumulations of microorganisms and recently deposited uncalcified supragingival calculus; (2) dislodge collections of food debris and accumulation of microorganisms from the interproximal spaces below contact areas and between the teeth; (3) gently massage gingival and gum tissues to promote good blood supply and adequate keratinization of epithelium; (4) not irritate or lacerate gingival tissues. "Pink toothbrush" from bleeding gums indicates presence of gingival inflammation or improper brushing technic.

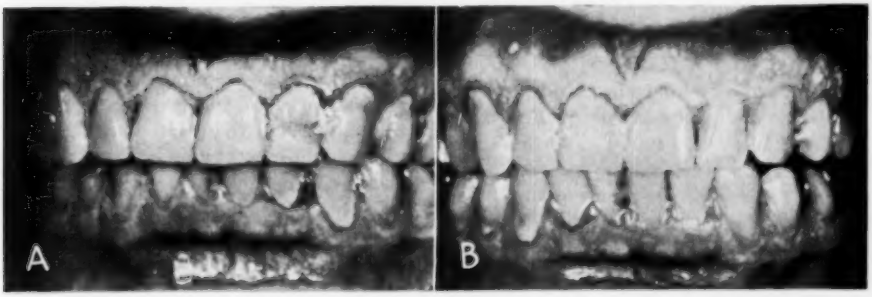


Fig. 2 • Mouth of man about 40 years of age who participated in toothbrushing experiment. A: After two weeks during which left side of mouth was not brushed. Note gingivitis on that side. B: After two more weeks, during which left side was brushed but right side was not brushed. Left side is almost normal again but marginal gingivitis is present on right side

If the toothbrushing procedures employed by a patient do not meet these aims, another technic should be recommended. A different stroke should be tried, or perhaps a longer brushing time. Also, careful use of a round, hard, wooden toothpick will often assist the toothbrush in dislodging accumulated debris from interproximal spaces and at the same time will massage gingival tissues. Correct use of dental floss and dental tape is occasionally indicated to improve cleansing of interproximal surfaces and spaces. Mild mouth rinses may occasionally aid in oral cleanliness, primarily because of their mechanical action.

TOOTHBRUSHES

The interesting history of the toothbrush has been told in detail by Hirschfeld[10] so need not be repeated here.

The most popular type of brush in use today, and the one we recommend, has a straight, semirigid handle approximately 6 inches in length with a small head about 1 inch long. Most of the handles are of cellulose or resinous plastics, which are cheap, impervious to moisture, durable, and of pleasing appearance.[11] The bristles are approximately ½ inch long, bound in tufts ⅛ inch apart, and mounted in two rows of 6 tufts each (Fig. 3A). The tufts are pointed and trimmed to uniform height. Such a brush is entirely adequate for cleansing the teeth and gingival massage and can be used in any of the technics mentioned below, excepting the physiologic technic.

There has been much discussion regarding the stiffness of the bristles to be recommended, but there are no accepted standards. In the past most dentists have recommended the stiffest bristles available, on the theory that firm pressure to the gingival tissue can be obtained only if such a bristle is used. However, careful observation will show that too stiff a brush can produce injury to delicate gingival tissues and that if a mild gingivitis is present, a stiff bristle will lacerate the flabby, hyperemic tissues. Consequently, it is well to recommend medium bristle brushes, since even healthy tissues can be massaged satisfactorily with them.

Before World War II it was believed that bristles from the hide of animals living in cold climates were the best. Most of the bristles came from the wild boar of North China. When the war interfered with this source of supply, a nylon filament was developed and generally used. The first nylon bristles were very stiff and, inasmuch as they did not soften when moist as would a natural bristle, they were found to be too harsh by many patients. As a result, most dentists are prejudiced against them, and recommend only natural bristles. It is believed that natural bristles are more resilient and more easily tolerated by gingival tissue. Phillips reports that abrasiveness of dentifrices on enamel is accentuated by nylon bristle brushes.[12]

However, nylon filaments have many advantages. They are more easily cleansed, they will apparently last about a third longer than a natural bristle brush, they do not become soggy and soft, and they do not split or abrade easily. Furthermore, nylon bristles can be more easily standardized so far as stiffness is concerned. Although the formula for nylon varies,[13] for practical purposes it can be stated that the stiffness of the nylon brush depends upon the diameter and length of the filament. In Great Britain the Ministry of Health has arbitrarily stated that soft nylon bristles shall be 0.012 inch, medium bristles 0.013 inch and hard bristles 0.014 inch in

10. Hirschfeld, Isador. The Toothbrush: Its Use and Abuse. Brooklyn, N. Y.: Dental Items of Interest Publishing Company, Inc., 1939.

11. Council on Dental Therapeutics, American Dental Association. Accepted Dental Remedies, ed 15, Chicago: American Dental Association, 1950, p. 116.

12. Phillips, R. W., personal communication.

13. Barron, Harry, Modern Plastics. New York: John Wiley & Sons, Inc., 1945, p. 553.

14. MacFarlane, D. W., The stiffness of toothbrushes. Brit. D. J. 79:179 (Oct. 5) 1945.

diameter.[14] Although it is possible to distinguish between stiffness of filaments of brushes 0.012 and 0.014 inch in diameter, this range probably is not sufficient. Some dentists recommend nylon filaments as small as 0.007 inch in diameter.[15] However, the oral tissues will tolerate a somewhat stiffer brush. A nylon filament 0.010 inch in diameter can be considered a soft brush, 0.012 inch a medium brush, 0.014 inch a stiff brush, and 0.016 inch an extra-stiff brush. A medium brush is stiff enough for use. Incidentally, it has been shown that the shape of the ends of the nylon bristles is unimportant; round-end bristles do not appear to be any safer to use than cut-end bristles.[16]

The problem of stiffness of natural bristle brushes is more complex. Bristle stiffness varies according to (1) the diameter of the bristle, (2) the length of the trim, and (3) the inherent resiliency of the natural bristle. This third factor varies markedly with natural bristles, with the fraction of the bristle which is used, and with the length of the natural bristle. A brush made of bristles trimmed from the base or butt of a long natural bristle will have a character different from one made of bristles trimmed from a higher part of the bristle. Since from year to year and from locality to locality there will be some difference in the resiliency of the bristles, and since there is no official stiffness standard, a medium bristle brush sold by one company may be equivalent to a soft brush sold by another.

A brief study of toothbrushes purchased on the open market has shown that most manufacturers mark the boxes containing natural bristle brushes "medium," "hard," or "extra-hard," but do not mark the brush itself. (The term "hard" brush is not accurate: "stiffness" of the brush is more accurate.) When the brushes were taken from the boxes and mixed, it was difficult to determine accurately the difference between the hard and the extra-hard bristle brushes, particularly if different brands of brushes were tested. Moreover, as a natural bristle softens when it is wet, patients will note that they start with a brush of one degree of stiffness and end with a brush much softer. For these reasons prescriptions can be more accurate if they specify nylon bristle brushes. However, only a nylon bristle which is about 0.012 inch in diameter can be recommended. The one serious objection to natural bristle brushes is the lack of standardization of stiffness of the bristles, although the nylon brushes do wear better and are more easily cleansed and dried. Research to determine the "limits of safety" in stiffness of brushes is needed. In the meantime, recommendations will vary according to personal opinions of the dentist and the patient.

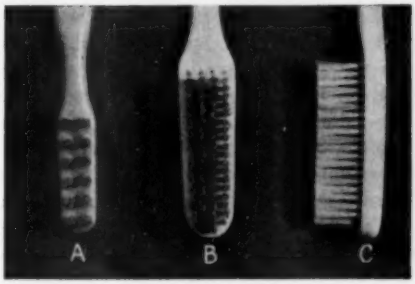


Fig. 3 • Types of toothbrushes recommended: A, for most toothbrushing technics; B and C, for the physiologic technic

TOOTHBRUSH TECHNICS

Careful review of the literature indicates that toothbrushing technics can be grouped into the following eight general classes:

15. Bass, C. C., Optimum characteristics of toothbrushes for personal oral hygiene. D. Items Interest 70: 496 (July) 1948.

16. Risser, Stella, Prevention of periodontal and dental diseases. J. Houston Dist. D. Soc. 13:8, 10, 12, 14 (July) 1942.

1. Scrub Brush Method • A brush is grasped firmly and the ends of the bristles rubbed vigorously over all surfaces of the teeth and gums in a manner similar to scrubbing a wooden floor. This haphazard technic can be recommended only for the occlusal surfaces of teeth, because it does not adequately clean the teeth or stimulate the gum tissue (Fig. 4A).

2. Fones' Technic • The teeth are held in occlusion and the brush is pressed rather vigorously against the teeth and gums and revolved in circles with as large a diameter as possible (Fig. 4B). This technic is fairly effective, particularly for young children who cannot master or do not need a more complex toothbrushing procedure. Its value is limited, however, in the treatment of patients with periodontitis, because it does not care adequately for the interproximal areas.

3. Roll Technic • The bristles of the brush are placed as high in the vestibule as possible in the buccal region, with the sides of the bristles touching the gum tissue. The patient then exerts as much lateral pressure as the tissues can tolerate with the sides of the bristles, and the brush is moved slowly occlusally (Fig. 4C). This tissue blanches under pressure as the blood is forced out of the capillaries. As the brush approaches the plane

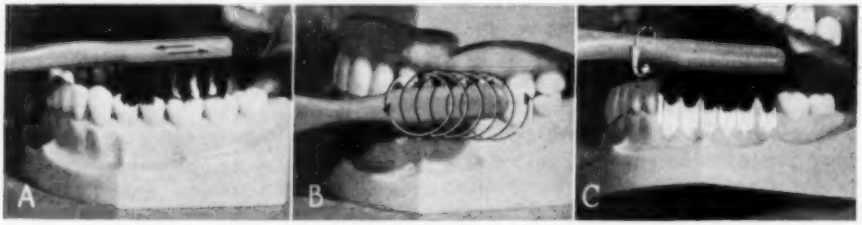
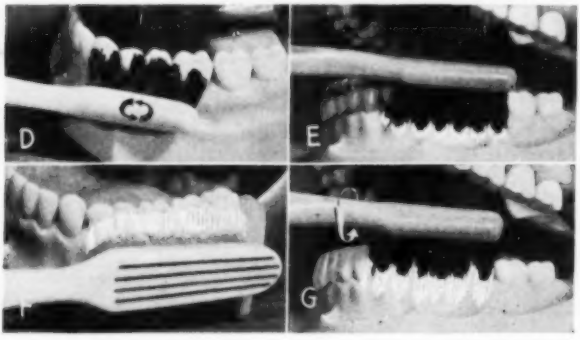


Fig. 4 • Toothbrushing technics. A: Scrub brush technic. Brush is carried back and forth over all surfaces of teeth in haphazard manner. B: Fones' technic. Teeth are held together and brush is carried in large concentric circles, brushing upper and lower arches at same time. C: Roll technic. Brush is placed as far apically as possible with sides of bristles touching gingival tissues. Using much lateral pressure, brush is carried occlusally, rolling it slightly so that at the end of the stroke the ends of bristles touch the enamel



D: Charters' vibratory technic. Brush is placed as illustrated and vibrated gently to force bristles into interproximal spaces. Brush then moved to another area and vibrating repeated. E: Stillman's vibratory technic. Brush, placed as illustrated, is vibrated gently to force bristles between teeth. F: Physiologic technic. Using a soft brush, teeth and gingival tissues are brushed by using a stroke directed apically. G: Combination roll and vibratory technic

of occlusion, the brush is turned slowly so that the ends of the bristles touch the enamel of the tooth. Release of the pressure allows the blood to rush into the capillaries again. The brush is then placed as high in the vestibule as possible and the rolling motion is repeated. Patients are instructed to give each area eight definite strokes toward the occlusal surface of the teeth; the brush is then moved to a new area. This roll technic cleans the teeth adequately and gives ample massage to the gingival tissue.

4. Vibratory technics • The two vibratory technics, Charters' and Stillman's, have much in common. Both use the sides of the bristles for gingival massage, with the bristles bent to prevent the ends of the bristles from injuring soft tissue. Both are rather difficult to learn and if improperly used can produce damage to gingivae. Neither is particularly useful in removing debris from between and around the teeth after it has been dislodged, so it is recommended that both be followed with a vigorous mouth rinsing with tap water.

A. Charters' technic • This widely advocated technic is performed by placing the ends of the bristles in contact with the enamel of the teeth and the gingival tissue with the bristles pointed at about a 45 degree angle toward the plane of occlusion. Much lateral and downward pressure is then placed upon the brush and the brush is vibrated gently back and forth a millimeter or so (Fig. 4D). This gentle vibratory procedure forces the ends of the bristles between the teeth and cleans the interproximal tooth surfaces very well. In fact, Gottlieb[17] stated that in his opinion this was the only technic that would be of any value in the control of dental caries. The technic also massages the interproximal tissues adequately.

B. Stillman's technic • The technic credited to Stillman[18] is performed by placing the brush in approximately the same position as required for the beginning stroke in the roll technic, except that it is nearer the crown of the teeth. The handle is vibrated or "shimmied" gently in a rapid but slight mesiodistal movement (Fig. 4E). This technic forces the bristles into the interproximal spaces and hence cleans the teeth in that area very well. It also does an adequate job of massaging the gingival tissue.

5. "Physiologic" Technic • Recognizing that food is deflected apically during mastication, Smith [19] and Bell,[20] among others, advocate that the gingival tissue be brushed in the same direction. The technic is simple. Using a very soft camel's-hair brush which contains about 75 tufts arranged in rows 4x19 (Fig. 3, B & C), the gingival tissues are brushed from the crown toward the root in a gentle, sweeping motion (Fig. 4F). This technic probably stimulates the free gingival and interproximal tissues as well as any other and it can be recommended if the patient uses the proper brush in the proper manner.

6. Miscellaneous Technics • Many other technics are being advocated. For example, Leonard[21] recommends that

> . . . the teeth be held edge to edge with the bristles against the teeth at right angles to the long axis of the teeth. The brush is then vigorously moved without great pressure and with the stroke that is mostly up and down on the tooth surfaces with just a slight rotation or circular movement. After striking the gingival margin enough pressure is used to force the bristles into the interproximal area.

17. Gottlieb, B., Dental Caries. Philadelphia: Lea & Febiger, 1947, p. 130.

18. Stillman, Paul R. & McCall, J. O., A Textbook of Clinical Periodontia. New York: The Macmillan Company, ed. 2, 1937, p. 259.

19. Smith, T. Sydney, Anatomic and physiologic conditions governing the use of the toothbrush. J.A.D.A. 27:874 (June) 1940.

20. Bell, D. G., Teaching home care to the patient. J. Periodont. 19:140 (Oct.) 1948.

21. Leonard, H. J., Conservative treatment of periodontoclasia. J.A.D.A. 26:1308 (Aug.) 1939.

Others recommend specific technics and undoubtedly get good results with them. Use of specially designed brushes[22] with bristles held at an angle, with flexible head, is recommended by some.

7. Motor-Driven Toothbrushing • Motor-driven toothbrushes should be mentioned because they may prove to be of value for the occasional patient who cannot adequately carry out complex instructions for gingival massage. Just prior to the war, some were being manufactured which vibrated the brush in a small circle. Motor-driven brushes are a lazy man's way to clean the teeth and massage the gums, but some of them are remarkably effective. Their use will be limited because of the cost.

8. Combination of Technics • Perhaps the most effective method of brushing the teeth depends upon the dentist's evaluation of the patient's needs and then adaptation of one or more of the above technics to the individual's needs. All patients should begin their toothbrushing by using the scrub brush method on the occlusal surfaces. The other procedures should be recommended according to need. For example, for children with no periodontal problem Fones' technic should be recommended. This technic is easy to teach to groups of children and is effective enough for them. It is much less time-consuming than some of the more detailed and exacting toothbrushing technics and is better than the scrub brush method.

For the young adult the roll technic is advisable. If periodontitis is present, the patient can be taught Stillman's vibratory technic in conjunction with the roll technic (Fig. 4G). As the brush is carried occlusally, and rolled slightly, the handle is gently vibrated to force the bristles between the teeth.

The time required for adequate brushing will vary according to the need and skill of the patient. Three to five minutes before retiring and again upon arising are probably adequate.

It should be emphasized that most of the technics described will get satisfactory results. The problem is not solved by the purchase of any one kind of brush or the teaching of any one technic. Rather it is essential that patients be impressed with the importance of following specific procedures carefully and thoroughly, starting in one area of the mouth and systematically progressing until all the teeth, gingivae, and gums have been brushed. If patients perform correctly the physiologic technic, or the roll technic, or either of the vibratory technics, the results will be gratifying. The important point is that the brushing be done in a careful, thorough manner daily. Figure 5 illustrates the effect of proper care of the mouth at home by a diabetic patient.

DENTIFRICES

No dentifrice on the market today has proved to be of therapeutic value for chronic periodontal diseases. From the periodontist's point of view, the formula of Fenton[23] is adequate: he recommends for a dentifrice equal parts of water and elbow grease. Most people will use dentifrices because of their pleasant taste. Some dentifrices polish the teeth well, and therefore have a cosmetic value to the patient.

Dentists err when they dismiss a patient's questions regarding dentifrices with a shrug of the shoulders. Patients should be told the functions of the dentifrice are as follows: (1) To aid in cleansing the teeth. For this reason, a mild dentifrice containing an effective polishing agent will be of some value to clean the teeth and remove debris from

22. Alstadt, Benjamin, Toothbrush. A further study: relative to cervical anatomy. J. Periodont. 14:77 (July) 1943.

23. Fenton, H. R., Toothpastes, powders, brushes and mouthwashes. North West Den. 23:41, 50 (Jan.) 1944.

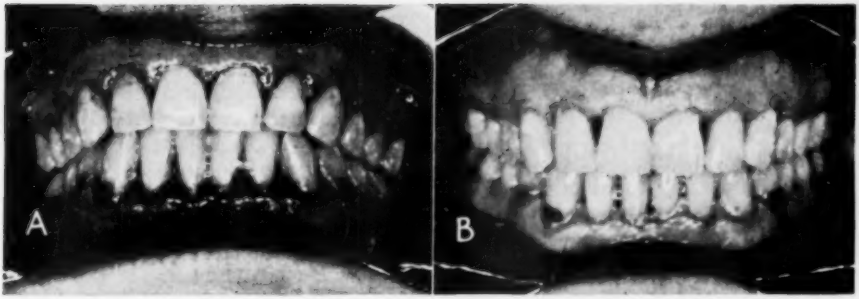


Fig. 5 • Mouth of a diabetic patient. A: Chronic inflammatory gingivitis. In spite of good dental treatment, gingival tissues are soft, tender and easily injured. B: After six months of excellent home care, gingival tissue is well stippled and fits snugly around the teeth

around the teeth. (2) To make the brushing procedure more pleasant. A dentifrice should be chosen that is pleasant to use. The other requirements for dentifrices are negative ones: they must not injure enamel or soft tissue, interfere with enzymatic action of saliva, or be unduly expensive.

The value of medicated dentifrices is debatable. It seems certain that bacteria do not cause periodontitis, but that many varieties of microorganisms complicate the condition. Bacteria do invade the tissues to a limited degree and cause a mild inflammatory and suppurative reaction. Control of the bacteria by a mild antiseptic would be of limited value, however, because of the impossibility of sterilizing the mouth without damage to tissue and because the bacteria plaques would be re-established again shortly after use of the antiseptic. It can be theorized that a mild antiseptic, such as chlorophyl, if incorporated in a dentifrice, might have some benefits in so-called "supperative periodontitis," but this has not been proved.

Use of an ammoniated dentifrice is reported to keep the mouth free of bacterial debris,[24] but there arises the question whether an alkaline reaction around the teeth might predispose the patient to calculus deposition. One of the well known theories in the etiology of calculus deposition is that ammonia is liberated in the mouth which alkalinizes the saliva, and hence allows a precipitation of calcium from saliva. Clinical studies of the use of ammoniated dentifrices so far have not shown an increase in calculus deposition, but the best and most carefully controlled clinical studies of these dentifrices have been made on children who usually show very little tendency toward calculus deposition. The effect of ammonia-producing dentifrices on calculus depositions must be carefully watched, for it would not be desirable to effect a reduction in dental caries at the expense of an increase in calculus in older patients where dental caries is less common than periodontitis.

Because no dentifrice is known to be of value in periodontitis, the patients' question—"What dentifrice should I use?"—may be countered by asking what dentifrice they prefer. If they mention a dentifrice which is known to be efficient, they may be told that that dentifrice is satisfactory and that they may continue to use it. No more definite an-

24. Kesel, Robert G., personal communication.

swer can be given until actual specifications for abrasiveness, emulsifying action, and so forth, are established.

DISCUSSION

Periodontists readily admit that good daily home care by a patient with periodontitis is an essential part of any satisfactory system of treatment. Most periodontists also are convinced that prevention of periodontal disease and maintenance of reasonable oral cleanliness can be accomplished only if patients are willing and able to perform daily the few simple procedures required to cleanse the oral cavity. Yet most dentists spend little time in teaching their patients how to care for their mouths and even less time in teaching the value of home care.

A critical study of dental literature leads to the conclusion that healthy gingival tissue can be maintained if any one of many different toothbrush technics are used correctly. In fact, analysis of various technics indicates that the one important factor common to all procedures is the thoroughness with which a brush is used to free the teeth of debris and to massage gingival tissues lightly. To get good results the toothbrush should be used methodically, regularly, and carefully; the actual direction of the stroke is of secondary importance. It is generally agreed that the brushing should be done in a manner which will not allow the ends of the bristles to irritate the gingival tissue: the sides of the bristles should be pressed against the soft tissues. As much lateral pressure should be used as the patient can tolerate.

No dentifrices available today are of proved therapeutic value in periodontitis. One of several mildly alkaline dentifrices containing an effective polishing agent and of palatable flavor will aid in the mechanical cleansing of the teeth and make brushing more pleasant.

SUMMARY

1. Available evidence leads to the conclusion that gentle gingival massage correctly applied is helpful in the control of periodontitis.

2. Emphasis should be placed by the dentist on the value of home care in the maintenance of good oral hygiene. Unless the patient is motivated to maintain good oral hygiene, carefully, tediously and persistently, the dentist's treatment of periodontitis, whether surgical or prophylactic, will result in only temporary improvement.

3. There is no one universally preferred technic for toothbrushing. The dentist should teach the patient a definite detailed technic which he has chosen to suit the individual patient's needs.

1121 West Michigan Street

Pursuit of Truth • All truths in nature, all inventions by which they can be developed, are worthy of our study, for their own sake, rather than with any idea of profit or interest. Whatever can enlarge the views of the mind, raise new sentiments of intellectual pleasure, or make us acquainted with new properties and powers in the substances surrounding us, is in the highest degree worthy of the pursuit of a being whose noblest faculties are reason and the love of knowledge. *Humphry Davy*, quoted in an editorial, *"The Research Worker," The Dental Journal of Australia, 21:366, August, 1949.*

The application of biochemical methods to dental research

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In order to determine the basic mechanisms involved in most dental problems, it is essential to answer three fundamental questions: (1) What substances take part in the process under investigation? (2) How are these substances located with reference to one another? (3) What changes, both in location and time, do these substances undergo during the process under investigation? These questions often can be answered by applying biochemical methods and, when the answers are available, it frequently becomes possible to explain the mechanisms by which the process occurs.

It is, therefore, an encouraging fact that dental research workers are more and more adopting the methods and apparatus of other fields of science for the solution of specifically dental problems. At the same time, as is always the case in scientific research, the solution of each problem gives rise to many new problems which must often be solved by the use of entirely different methods. In general, it can be said that almost any method now in use in the biochemical laboratory is potentially available for dental research. Some of those which have actually been so applied will be discussed briefly here.

The older technics of biochemical analysis, with their emphasis upon color reactions for the identification of specific compounds, are often sufficient to indicate the compounds present in relatively simple mixtures. Unfortunately, however, biological materials are rarely composed of simple mixtures, and so direct application of ordinary chemical tests often fails because of interference by closely related substances. The major problem then becomes one of separating the components of such mixtures.

The chemical similarity of proteins, for example, prevents anything but the crudest separation by ordinary chemical means. Physicochemical methods must be used if any isolation of pure proteins is to be accomplished. If the proteins are soluble, the most practical and widely used method is the Tiselius technic of electrophoresis.[1] This depends on the electrical charges characteristic of all protein molecules. These differ for every protein. When an electrically charged protein is placed between oppositely charged poles, it will move toward the pole bearing a charge opposite to its own. The rate at which it migrates will be determined by the charge it bears. Since this varies for each protein, the rate of migration of each protein will be different. By allowing a sufficient time for the proteins of a mixture to distribute themselves along a column of liquid, and

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1. Alberty, R. A., An introduction to electrophoresis. J. Chem. Education 25:426 (Aug.) 1948.

then separating the column at various points, relatively pure components can be isolated. The degree of purity of these compounds can also be determined by noting whether any further separation occurs when the process is repeated with them.

If the proteins under investigation are not soluble, as is the case with enamel protein, other methods may be used. Much can be learned by hydrolyzing the proteins, then separating and identifying the individual amino acids of which they are composed. The recently developed method of paper chromatography[2] can usefully be applied here. In this method, the mixture of amino acids is placed at one edge of a strip of moist filter paper, and a second liquid, insoluble in water, is allowed to diffuse along the paper. Such liquids as phenol, collidine, or butyl alcohol may be used. The amino acids are soluble in both the liquid and the water, and so distribute themselves between the two liquids on the filter paper. The distribution will differ for each acid. As the water-insoluble liquid advances, it carries the acids at different rates over the paper. Eventually the strip is sprayed with a solution of ninhydrin and warmed to develop the characteristic purple color which this reagent gives with amino acids. A purple spot is then seen on the paper at each spot to which an amino acid had migrated. By comparing these spots with those on a strip of paper treated with known amino acids under identical conditions, it is possible to tell which amino acids were present in the original hydrolysate. This method can also be applied to substances other than amino acids. The method offers much promise for dental research, since the proteins of enamel and dentin are important in any study of tooth formation or dental caries.

The identification and localization of many substances in biological mixtures has become much simpler since the introduction of radioactive tracers. The uptake of even minute amounts of any radioactive element used in the metabolism of a tissue can be followed by means of a Geiger counter. In many cases, when a section of tissue is placed in contact with a photographic plate, any part of the plate in contact with a radioactive substance will be exposed. The developed plate, known as a radioautograph, will indicate the exact location of the radioactive material in relation to the anatomic structures of the tissue.

A method with so many potentialities has naturally been widely used in studies of tooth metabolism.[3] Owing to its relatively long period of radioactivity, radioactive phosphorus has proved most useful in such studies. Considerable information as to exchange reactions between enamel or dentin and the surrounding fluids and tissues has thus been obtained. Other radioactive isotopes, such as those of calcium, fluorine, and iodine, have also been employed. The list of available isotopes is now so great that almost any phase of the mineral metabolism of the teeth can be studied.

The direct localization of chemical substances at the site of their action by the use of nonradioactive methods is becoming increasingly important. This may involve identification of submicroscopic structural elements of enamel or dentin or the actual identification of chemical substances in the cell.

Enamel is a complex structure, in which many of the details of prisms, prism sheaths, and interprismatic substance have been revealed by the usual histologic methods. However, more advanced technics have made it possible to study structures which cannot be revealed by the ordinary histologic methods.

2. Consden, R., Partition chromatography on paper, its scope and application. Nature 162:359 (Sept. 4) 1948.

3. Wainright, W. W., Dentistry and the atomic energy program. New York J. Den. 19:325 (Oct.) 1949.

The electron microscope, which magnifies many times more than an ordinary microscope, is opening a whole new field to interpretation.[4] In enamel it has revealed the presence of surface structures varying from smooth, apparently highly calcified structures, to etched areas in which the ends of enamel rods and prism sheaths are clearly shown. Such minute surface variations are probably important in the earliest stages of caries and will have to be taken into consideration in any comprehensive theory of caries etiology. In addition, electron microscope studies are aiding in revealing the true nature of the reaction by which topical application of fluorides changes enamel surface structure. The recent identification of minute crystals of calcium fluoride on such surfaces is very significant. Future work may be expected to show the conditions under which such reactions occur best, as well as possible conditions under which such crystals may be removed.

In recent years, few studies of tooth structure by polarized light have been made. However, such studies are capable of revealing much of the nature of enamel substructure and its changes. The great value of this work lies in its revelation of the orientation of the fibers and crystals in enamel, and of the conditions under which either structure may be absent.[5] The important experiments of Schmidt and his co-workers during the years 1924-1938 showed that organic and inorganic structures are intermeshed with one another throughout the entire body of the enamel prisms. Thus organic material is located not merely in the obvious lamellae and prism sheaths, as has so often been assumed, but throughout the entire enamel structure. The use of polarized light makes it possible to determine whether organic or inorganic matter is being removed from this intermeshing network. Therefore, it should be very helpful in revealing the changes which occur in caries. A preliminary study of this type has been made by Keil.[6]

In soft tissues, localization of substances in cells becomes the major problem. Here the methods of the relatively new science of histochemistry are invaluable. Neither histology nor chemistry alone can be expected to furnish as much information as this science which utilizes the methods of both of them.

The chief problems of histochemistry are to preserve the individual components of the cell in their original locations during dehydration and fixing, and then to identify them.[7] The older methods of histological fixing and staining often caused great distortion in the cell, and many artefacts were introduced. Much of this difficulty can be avoided by rapid freezing of the tissue, which preserves its original structure, dehydration in a high vacuum at low temperature, and infiltration with paraffin before sectioning. Another method, useful for localizing mineral matter, is microincineration on the microscope slide. This destroys the organic matter, leaving the inorganic substances in their proper location. Chemical tests then reveal the nature of these substances.

As yet, the chemical tests for many important biological substances in the cells are poor. However, an example of the value of histochemical technics is given by the information on the mechanism of calcification which they have revealed. Fortunately, there are relatively good histochemical tests for calcium, phosphatase, and glycogen. The time relations in the activity of phosphatase in a calcifying tissue and the subsequent release

4. Scott, D. B., and Wyckoff, R. W. G., Shadowed replicas of tooth surfaces. Pub. Health Rep. 61:697 (May) 1946; Studies of tooth surface structure by optical and electron microscopy. J.A.D.A. 39:275 (Sept.) 1949.

5. Leicester, H. M., Biochemistry of the Teeth. St. Louis: C. V. Mosby Co., 1949, pp. 107-113.

6. Keil, A., Der menschliche zahnschmelz im kariosen zustand. Deutsche Zahn-,Mund-,Kieferheilk. 4:60 (Jan.) 1937.

7. Glick, D., Techniques of Histo- and Cytochemistry. New York: Interscience Publishers, Inc., 1949.

of calcium when the actual calcification chiefly occurs have given a much clearer picture of the mechanism involved here.[8] The initial presence of glycogen in the tissues and its disappearance before calcification is complete, as shown by histochemical methods, indicate the importance of this substance in the earliest stages of calcification.

The histochemical methods which have just been discussed have offered examples of the value of the localization of compounds in cells, and they have also indicated how this technic may be used in answering the third question proposed at the beginning of this paper. By making histochemical studies of cell constituents at various stages of a biological process, it becomes possible to determine the changes which occur, both in nature and location, and so to infer some of the mechanisms that may be involved.

Still another method for determining such mechanisms deserves consideration. It depends upon the fact that most physiologically important reactions appear to be chain reactions; that is, each step in a process depends upon the step immediately preceding it, and in turn, each step produces the conditions which permit the occurrence of the step which immediately follows it. If the chain is broken at any point, the entire process is stopped or diverted. There are various ways in which such a breaking of the chain may be produced. A specific inhibitor of the enzyme which catalyzes one of the intermediate reactions will stop that reaction, and so break the chain. The importance of fluoride in inhibiting the action of phosphatases and thus preventing the phosphorylating steps of carbohydrate fermentation appears to be an example of such an interruption, since fluoride prevents acid formation by bacteria.[9]

Another method is the introduction into the stepwise process of a compound sufficiently similar in chemical structure to enter the chain, but sufficiently different to prevent it from following its normal path. The chemical similarity of the sulfonamide drugs to the biologically important para-aminobenzoic acid, or of the antihistaminic drugs to histamine, is apparently sufficient to permit these compounds to divert certain cell reactions from their usual course, and so to produce striking biological effects. Much can be learned of the nature of chain reactions by interrupting them at various intermediate steps with suitable reagents. In addition, these chain-breaking substances offer the greatest immediate hope of preventing such complex, stepwise processes as caries now seems to be. Therefore, in addition to their theoretical importance, such substances may be of immediate practical value.

From the few examples which have been discussed, it is evident that the newer biochemical concepts and methods have many applications to dental problems. It can confidently be expected that these applications will explain many difficult problems and open many new fields in the coming decades. Dentistry as a science seems on the threshold of a bright future.

344 Fourteenth Street

8. Roche, J., La phosphatase des os et le mécanisme générale de l'ossification. Experientia 2:325 (Sept.) 1946.

9. Bibby, B. G., and Van Kesteren, M., The effect of fluorine on mouth bacteria. J. D. Res. 19:391 (Aug.) 1940.

Inhalation Anesthesia • Administration of agents for the production of general anesthesia by inhalation should be restricted to those who have had special training and experience in their administration. *Accepted Dental Remedies, ed. 14. p. 35.*

The role of the precision attachment in partial denture prosthesis

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The art of the replacement of missing teeth in the human dentition has been practiced over a long period of time. Examples of this art which were constructed several thousand years ago are in existence. Even in that far distant time, considerable ingenuity was displayed in their construction. Not much further progress was made until the first third of the nineteenth century.

One of the first authenticated instances of a bridge, which in any way approached our modern concept of replacement, was designed by Maury. In 1828 he published a paper in which he showed a six tooth anterior replacement anchored in the cuspid roots by means of posts placed in the enlarged pulp canals.

In April, 1855, Dr. William H. Dwinelle described a progenitor of the modern pin and plate bridge, together with a prototype of another type of bridge in present use.

In January, 1871, Dr. Benjamin J. Bing, applied for a patent on a bridge device to be anchored by wire extremities into cavities in the natural teeth. Soon after this the Morrison and Richmond crowns were developed for the restoration of individual teeth. It then became easy to restore missing members of the dental arch by attaching artificial substitutes to the adjacent teeth which were crowned for this purpose. These appliances were necessarily of the fixed type and, owing to the fact that they were constructed without adequate knowledge of the principles involved, most of these bridges were far from being a blessing to those for whom they were constructed. These ill-conceived and badly constructed devices were severely criticized and condemned perhaps somewhat unjustly on the ground that they were stationary and could not be properly cleaned. Thus was born the hue and cry against stationary or fixed bridgework.

As time went on and a proper understanding of the principles involved came about, together with much simpler and more effective technics of construction, the fixed bridge began to come into its own. I believe that the majority of the dental profession today is willing to concede that the fixed bridge, when properly constructed and placed, is the best method for restoring missing teeth.

The catchy phrase "teeth move in function" is true because all teeth are supported and cradled in a fibrous yielding periodontium. Necessarily, when they are subjected to stress, the teeth move slightly in their supporting alveoli,[1] owing to the

Read before the Section on Partial Denture Prosthesis, ninetieth annual session of the American Dental Association, San Francisco, October 20, 1949.

1. Tylman, S. D., Crown and Bridge Prosthesis, ed. 2, St. Louis: The C. V. Mosby Company, 1947.

slight compressibility of the periodontium. This movement is in proportion to the stress applied within the limits of the compressibility of the periodontium. All teeth which serve as abutments in any type of restoration, fixed or removable, are subjected to stresses, above the normal amount which they are designed to withstand.

When a fixed appliance is constructed the movement of the abutment teeth will be in proportion to the additional stress. On the whole movement will be greater but will be more limited in certain directions, owing to the fact that the abutments assume the stress collectively and not individually. This is one of the principal reasons why well constructed, fixed bridges have given such a long and satisfactory service. Many of the principles involved in the construction of appliances for the replacement of missing teeth apply equally to both types, fixed and removable. In the preparation of abutments and the construction of retainers, the natural contours of the abutment must be preserved. Abutments must be conservatively prepared so that the general well-being of the tooth will be preserved and the pulp permitted to remain in a normal condition. The occlusal surfaces of retainers must be so designed that the normal physiology and function of the tooth is retained, all margins must be so extended that they fall into comparatively immune areas, and are easily accessible for finishing and preparation so designed that the total length of the margin is held to the minimum.

Abutments should be prepared so that attachments used in the retention of removable appliances and the supporting lugs or attachments used in fixed appliances are housed within the circumference of the abutment (Fig. 1). Two means of retention of removable bridges are in general use today: clasps of various types and precision attachments. Clasps have certain advantages, the principal one of which is that the abutment teeth need little if any preparation. Such appliances are also easily constructed and can, therefore, be produced more inexpensively than any other type. Hence they are available in many instances where other types of appliances have to be ruled out for economic reasons. However, clasped teeth, of necessity, inadequately meet the requirements pre-

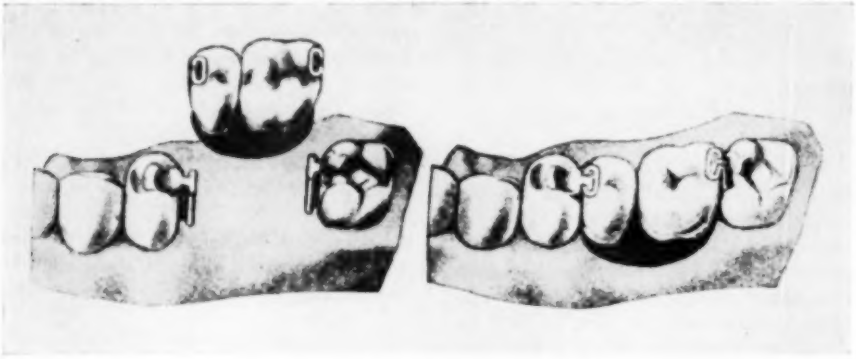

Fig. 1 • Misapplication in the use of precision attachments. The attachments are not housed in the circumference of abutments and no stops are provided to prevent excessive settling of the partial denture

viously laid down for abutments (Fig. 2). Clasps also have two other serious shortcomings. Clasped teeth that are unprotected are prone to develop caries under the clasp. When this occurs, it is difficult or impossible to make adequate restoration. Many times caries is not discovered until destruction is extensive. It is also difficult and sometimes impossible to construct a clasp denture so that the stress brought to bear on the abutment teeth, that is by clasps themselves, is in perfect reciprocal relation to each other. For instance, if a clasp is placed on a posterior tooth, using the standard type of construction, a lingual and buccal arm, it will be difficult for the tension on each of the arms to be exactly the same, whereby one will cancel the other. If one arm exerts stress in excess of the other, the clasp will act as an orthodontic appliance and the tooth will be moved sufficiently to equalize the stresses to the serious detriment of the periodontium. This, of course, is destructive to the abutment teeth.

Tinker[2] has said:

I wish to refer to the use of crowns for the abutment teeth that are to be clasped. I will say that I am perfectly willing to admit that I use more gold crowns today than I have since the advent of casting. I have no hesitancy, in fact, I would hesitate to use anything else on a molar tooth, unless I was practically certain that the condition of my patient was just about 100 per cent as far as mouth prophylaxis is concerned. It is a disheartening thing to construct a beautiful case with a three-quarter crown or an inlay as a restoration, and have the patient return in a short space of time with a line of decay extending over that portion of the tooth which is in contact with the clasp. These things happen with the best of us in such a large percentage of cases that I, for one, am crowning molar teeth in practically all of my restorations, whether fixed or removable.

Chayes[3] when speaking of clasps said:

1. The clasp would have to be movable in the partial denture to just a sufficient degree to release the abutments from stress during mastication and no more.
2. Buccal or labial and lingual or palatal portions or horns of the clasps would have to exercise precisely that same amount of tension against the abutment tooth, lest the partial denture assume the function of an orthodontic appliance, which, in fact, all of them are.
3. No part of the functional element should ever come in contact with unprotected enamel surfaces of the abutment.
4. A sufficient quantity of protecting element must be removed so that, when the clasp is in position, no appreciable change in the form of the abutment has been brought about.

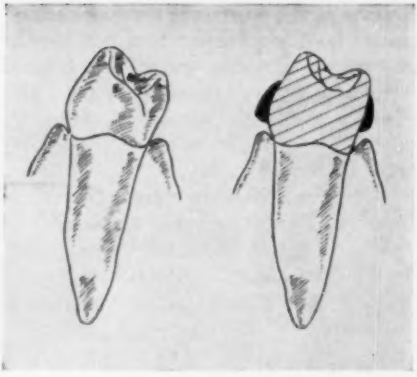

Fig. 2 • Left: Normal contour of lower bicuspid. Right: Cross section of same tooth with clasp. Contour of tooth is completely changed, preventing normal stimulation of gingiva during mastication

PRECISION ATTACHMENTS

The word precision has been defined as: quality or state of being precise; accuracy; definiteness. This definition permits considerable latitude in describing a precision attachment. It has been customary, heretofore, to classify only the buccolingual type as a precision attachment. But such is not the case. Peeso's split pin and tube and telescope crown, if well made, would come within the confines of this definition. The textbooks and journals which I have read prior to the prep-

2. Tinker, W. T., Partial Gold Saddle Cases and Clasp Attachments. J.A.D.A. 16:664 (April) 1929.
3. Chayes, H. E. S., What Constitutes an Ideal Partial Denture. J.A.D.A. 16:902 (May) 1929.

aration of this paper, are rather indefinite as to who made the first precision attachment for removable bridgework. Several texts which were published in the latter eighties and early nineties describe attachments which certainly come within this classification (Fig. 3).

Carr,[4] in 1898, gave a clinic before the Southern Dental Association in which he exhibited his method for accurate adjustable dentures, showing full upper and partial lower practical cases described as follows:

> The full upper denture was anchored to a cuspid root on the left and the third molar on the right. This denture was attached in such a way that it made it impossible to place an excessive pressure on either of the anchorage piers. At the same time it was easily removed and adjusted by the patient. Lower partial denture, comprising first molar on left and second biscupid, first and second molars on right, was anchored to second molar on left and second bicuspid on right. It was anchored in position, as far as any liability of being thrown out of position is concerned, yet adjustable and removable by the patient at will.

As a dental student in 1905, I remember seeing a Carr appliance similar to this description. It seems that even at that time Dr. Carr appreciated the necessity of properly distributing the load between the abutments and mucosa of the edentulous area. The forementioned textbooks show many ingenious devices for anchoring removable bridges. One type which particularly deserves mention, is the Morgan attachment, which was developed early in the twentieth century. Dr. Morgan had an attachment which was almost identical with the buccolingual attachments which are so extensively used today except that it was curved in form and was

4. Carr, C. M., Southern Dental Association Clinic. D. Cosmos 40:219, 1898.

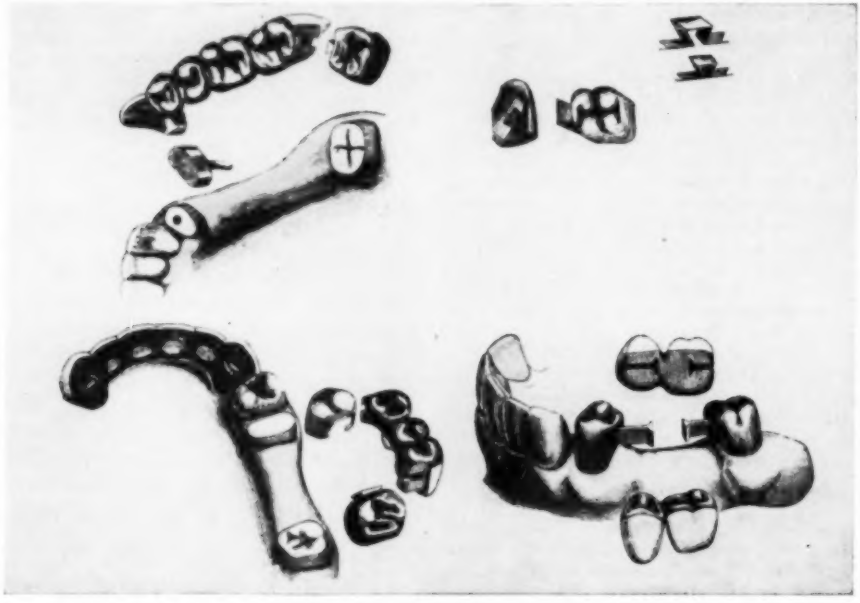

Fig. 3 • Various types of precision attached bridges

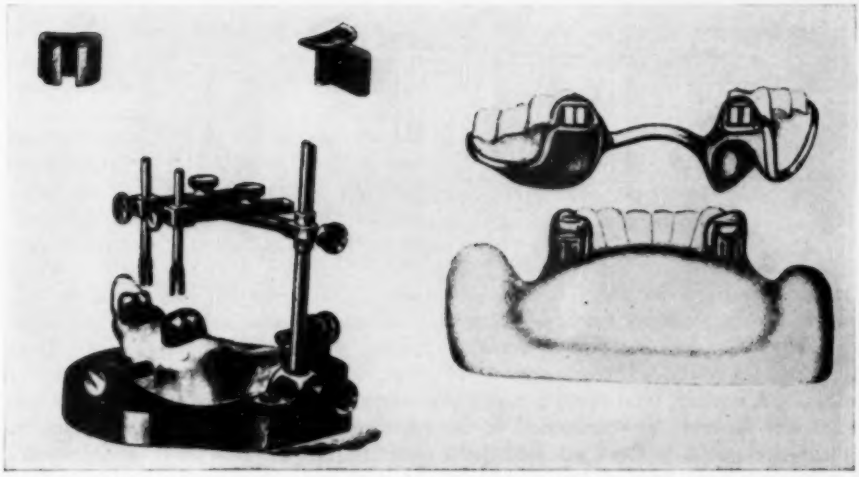

Fig. 4 • The Morgan attachment, which was developed in the early part of the twentieth century. The attachment and paralleling device are similar to those in use today

intended to be soldered on the outside of the crown or inlay retainer (Fig. 4). The parts of this attachment fit as accurately as the precision attachments in use today. Therefore, they had to be placed in perfect parallelism in order that the denture might be readily inserted or removed. For the purpose of parallelism, Dr. Morgan had an instrument which he called a jig. It was almost the same as the modern parallelometer. A few years later, Chayes[3] developed the present type of buccolingual attachment (Fig. 5). He had many imitators, among them Brown-Meyer, Gollobin, Stern, Yirikian, McCollum and others. Dr. Chayes developed what he called a movable-removable system of partial denture construction, his theory being that movability was necessary in order that the abutment teeth be permitted to make their normal cycle of movement without any inhibition whatsoever during mastication. He also believed that such a denture should have a well fitted saddle and that it should be so retained that in mastication it would displace the mucosa on which it was situated and, when the pressure was released, the mucosa, owing to its elasticity, would immediately return to its normal position. This contention of Dr. Chayes relative to the mucosa, is well founded, but whether it is necessary to adopt this method in small partial dentures involving one, two or three teeth is extremely doubtful in my opinion. In more extensive cases, however, especially extensive types, it is important that this principle be recognized and the structure so designed that the denture will fulfil the requirement in this regard.

There is a great division of opinion as to where removable and fixed partial dentures should be used. Many dentists became so imbued with the movable-removable theory that they refused to place any other type of partial denture. It seems to me that this has been carried to a rather ridiculous extreme. A few years ago, a dentist in an eastern city who was fully converted to this idea, referred a number of patients to me and in every instance these patients had from one to five removable bridges in their

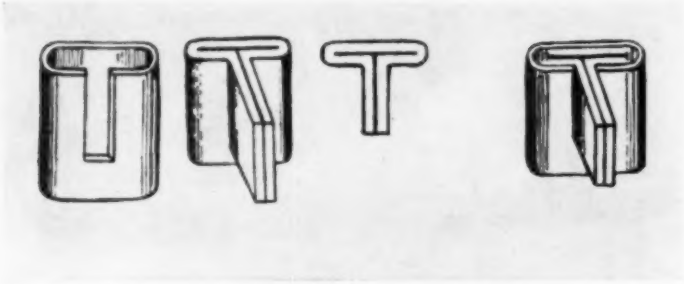

Fig. 5 • The original Chayes buccolingual attachment

mouths. A woman, who came in for consultation, immediately proceeded to remove five small bridges retained with precision attachments. They varied in size from a lateral incisor to a single molar. It is my opinion that this patient would have been better served, more comfortable and much less subject to mishap had well constructed fixed bridges been made for her. Fixed bridges, on the whole, are more comfortable than those which are removable.[5]

Most patients who wear a removable bridge are somewhat aware of its presence all the time, although they are not necessarily uncomfortable. However, if a well-made fixed bridge is placed, the patient in a short time, is just as comfortable as if he had his own natural teeth. The contention that removable bridges are best from the standpoint of cleanliness and sanitation is not well taken. If the individual is not careful of dental hygiene, there is nothing more unsanitary than a removable bridge. It takes a great deal of effort to take good care of removable bridges and keep them in a good state of sanitation, whereas, if well designed fixed bridges are made and placed where indicated, the care required to keep them hygienically clean is very small indeed.

After having used precision attachments for more than thirty years, I have come to the conclusion that the place where they are particularly indicated is in cases of extension saddles and in extensive cases which have an abutment at each end of the saddle. In this instance the denture many times can be further stabilized by the use of a lingual or palatal bar.

MATERIALS FOR THE CONSTRUCTION OF PARTIAL DENTURES

One of the first materials to be used in this work was gold, and the fact that it is still being used more extensively and successfully than any other material would indicate that to date it is the most ideal material available. The physical properties of gold are such that it performs well in the mouth environment. It can be combined with other metals to give almost any desirable physical properties relative to Brinell hardness, elasticity, and so forth.

Being almost chemically inert, in the majority of mouths, it is not subject to corrosion. Metallurgists have provided gold alloys which are adequate for any requirement in partial denture construction. Gold alloys are available with Brinell hardness as low as 40 or 45 and also those with Brinell hardness of almost 300. There are alloys of every range

5. Schwitzer, J. M., Restorative Dentistry, ed. 1. St. Louis: The C. V. Mosby Company, 1947.

of hardness between these two extremes. Therefore, where indicated, alloys which are very hard and resistant to wear and quite elastic, can be used, as well as those which are softer and which are particularly indicated in the restoration of occlusal surfaces. To date, nothing has been developed which in any way approaches the excellence of gold in the construction of partial dentures of all types.

Porcelain is still the pre-eminent material for construction of artificial teeth of all types. Though it has many physical properties which are not desirable, on the whole it is greatly superior to any other material that has been used for this purpose.

Plastics have been used for the construction of teeth for about ten years. So far none of them have physical properties which adequately fulfil the requirements. Their principal shortcoming is that they abrade rapidly. Therefore, crowns and bridges made of plastic have their occlusal surfaces destroyed quickly by abrasion, resulting, in many cases, in extrusion of opposing teeth.

Plastics of the acrylic type are the best denture base materials, and can be successfully used as bases for all types of removable partial dentures. They have the advantage over metal bases of being quickly and inexpensively rebased. Refitting a metal base denture is difficult and expensive. Therefore, in many instances, refitting is avoided as long as possible, often to the detriment of the patient.

EXTENSION PARTIAL DENTURES RETAINED WITH PRECISION ATTACHMENTS

In extension cases, if they are to function properly and not be a menace to the remaining teeth, some type of stress-breaker must be utilized. Many types have been developed. One of the early types was used with clasp dentures in which a spring was placed between the clasp and the denture base. This would act as a stress-breaker but unfortunately it had many shortcomings. On the whole, it was probably an unsatisfactory appliance. One of the worst features of this spring which attaches the clasp to the denture base is that it must necessarily be rather weak. Therefore, it is subject to distortion and I can conceive of nothing more vicious than a clasp which is attached to a denture base with a spring which has become distorted. It certainly would act as an orthodontic appliance and in a short time would seriously damage the abutment tooth.

Stress-breakers seem to be attracting more attention than ever today and many

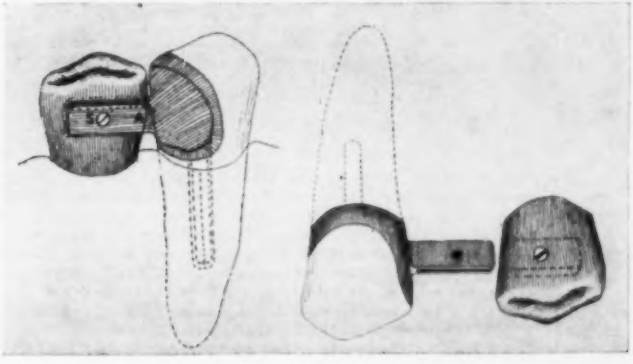

Fig. 6 • The Chayes distal extension stress-breaker used in conjunction with a Peeso split pin and tube

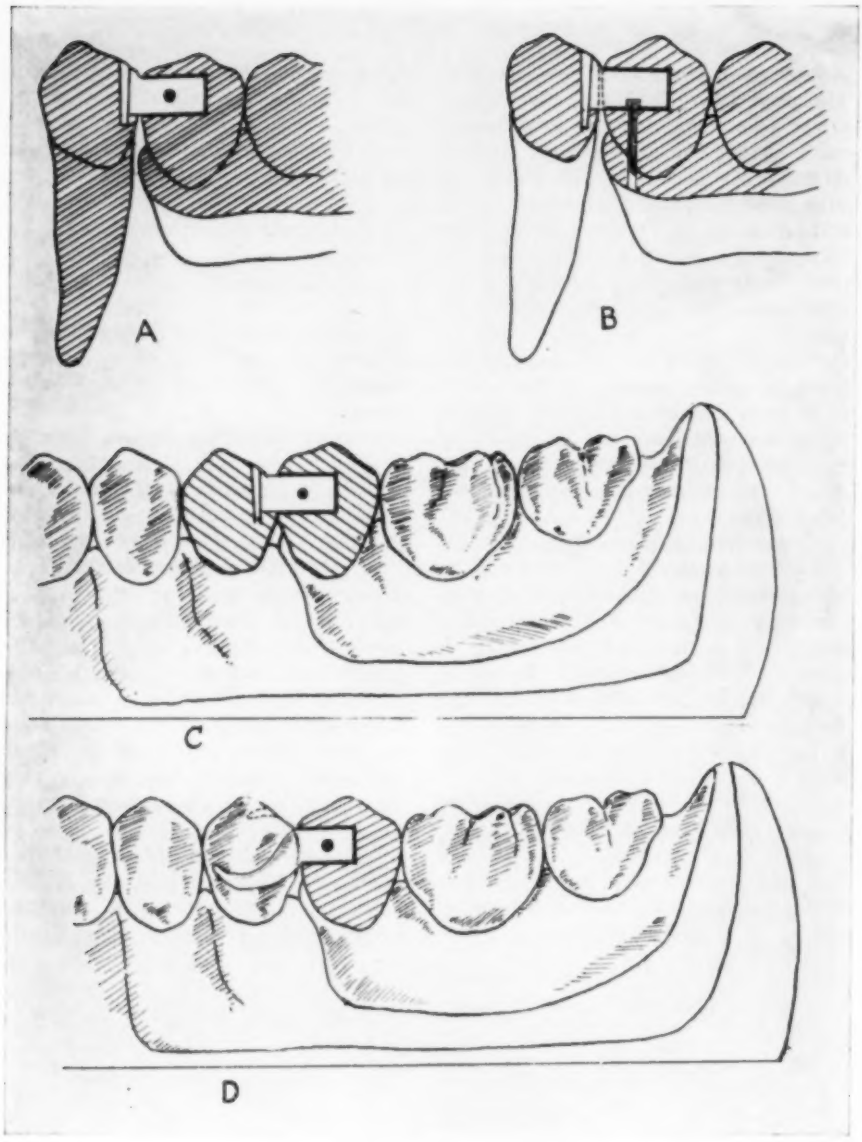

Fig. 7 • Application of the Chayes distal extension stress-breaker combined with a buccolingual attachment. A: Cross section showing conventional position of retaining screw. With this application there is always a possibility that the screw may act as a pivotal point or hinge. Under this condition the distal extension would not constitute an adequate stress-breaker. B: Another method of retention with the retaining screw coming from below and engaging a notch in the lower edge of the extension. After the upper edge of the extension has been relieved, it will float evenly on the supporting mucosa. There will be no pivotal action. C: An extension saddle case. Abutment and pontic supporting attachment and distal extension in cross section. D: Distal extension stress-breaker applied to a buccolingual clasp

types have been designed. Some prosthodontists have used a hinge type of stress-breaker. A hinge cannot possibly function as a stress-breaker should, because the pivot of the hinge acts as a rotational center, permitting the heel of the denture to settle an unlimited amount while at the pivotal point no downward motion is permitted at all. The underlying tissues will be destroyed and the denture will settle out of occlusion, and too heavy a burden will be placed on the abutment. Chayes[3] developed a device known as the distal extension stress-breaker (Fig. 6). And to date, this is the best appliance, for the purpose. Dr. Chayes used it in conjunction with the Peeso split pin and tube for the purpose of permitting the abutment tooth to undergo its normal cycle of movement. Dr. B. B. McCollum of Los Angeles conceived the idea of combining the Chayes buccolingual attachment with the Chayes distal extension stress-breaker. This is the most useful retaining device today. Dr. McCollum deserves a great deal of credit for having made this contribution to the art of partial dental prosthesis.

The distal extension stress-breaker can be modified to suit any condition that may arise. A satisfactory stress-breaker must permit sufficient movement for the mucosa to be displaced to the extent that it is able to assume nearly all of the stress to which the teeth of the partial denture are subjected (Fig. 7). The movability of this type of stress-breaker can be readily adjusted to various types of mucosa. For example, if the edentulous ridge is covered with a firm, resistant mucosa, which cannot be readily displaced, the movement of the distal extension can be very small. If the mucosa is soft and spongy and will yield considerably to the stress of mastication, the movement of the distal extension can be easily regulated to accommodate the condition.

In making adjustment of the distal extension, just enough should be cut away from the top of the attachment so that the greater part of the displacement of the mucosa will occur before the sleeve of the stress-breaker contacts the top of its arm. Partial dentures which are retained with clasps or attachments must have a definite stop. Otherwise, the tissues will be destroyed and the denture will soon be out of occlusion.

About twenty-five years ago, a type of stress-breaker was designed and placed on the market which was attached between the clasp and the denture base. This attachment permitted unlimited movement in every direction. The result was that all of the dentures that were constructed with it, so far as I have seen, soon caused destruction of the supporting tissues to the extent that the dentures were no longer in occlusion and became ineffective and of little benefit to the patient. The only good thing about this type of attachment was that under no condition could the abutment teeth be overloaded.

Now the distal extension permits enough controlled movement of the denture base and at the same time the movement is such that a definite stop tends to prevent destruction of the supporting tissues. Under these conditions it would seem that the abutment teeth have to withstand considerable additional stress, yet in view of the fact this type of stress-breaker has been used over a period of thirty years in extension partial dentures of all types, the majority of which have given very long and satisfactory service, even in cases where abutment teeth were somewhat questionable, this is not a very valid objection.

SUMMARY AND CONCLUSION

The requirements of a successful extension partial denture are as follows:

1. It must be sufficiently retained by some means so that it can function properly and will not be easily displaced.
2. It must be so retained that the stress of mastication is largely borne by the

mucosa of the edentulous area, the abutment teeth functioning only to hold the case in position and to act as a stop when the mucosa has been displaced almost to its limit.

3. The construction of the partial denture should be such that it is simple and rugged so that it will stand up well under the stresses to which it is subjected during function and not be easily distorted, bent, broken or misaligned during removal, cleansing and replacement.

4. The means of retention should be such that it will not cause destruction of abutment teeth through abrasion or caries.

5. Precision attachments are the most ideal for partial dentures, but their use is indicated particularly in extension cases. In small cases involving one, two or three teeth, where conditions are favorable, it is believed that fixed bridges will best meet the requirement.

6. All materials used in the construction of removable partial dentures should be chemically inert, strong and elastic so that they cannot readily be distorted or bent. All artificial teeth used should be sufficiently hard so that they will not abrade more rapidly than the natural teeth.

15372 Dickens Street

Root canal therapy for the developing and adult dentition: its importance in complete mouth rehabilitation

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Dentistry deals with two destructive forces: caries and periodontoclasia. Either process, when out of control, is capable of destroying the complete dentition. The destructive process of caries is often treated as an entity despite the fact that caries and periodontoclasia are interrelated. Often one may precede the other, or both processes may be working together, to destroy and mutilate the developing as well as the completed dentition.

Root canal therapy is directed mainly against the destructive process of caries and represents our last effort to prevent the loss of a tooth where the carious process has involved the pulp. If we are to guide the developing dentition to its ultimate completion and then safeguard the adult dentition, we must be prepared to deal with caries whether it involves the enamel, the dentin, or the pulp.

Root canal therapy, like other branches of dentistry, is not an isolated procedure. Failure to extend this service where it is needed may, depending on the age of the patient, produce a periodontal and restorative problem. A typical sequence of events following the loss of an upper and lower first molar, in an adult dentition, is the marked tipping of the teeth adjacent to the extractions, plunger action of the upper second molar upon the lower second

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Fig. 1 • Typical sequence of events following loss of upper and lower first molars

Fig. 2 • Effect of loss of permanent molar in a developing dentition

and third molars, producing food impaction with the breakdown of periodontal structures and recurrent decay (Fig. 1). In a developing dentition, an orthodontic problem may be created by the early loss of a permanent molar (Figs. 2 and 3). The loss of such a tooth deprives the mandible of some of the stimulation to further growth and development and, since the mandibular arch is the form upon which the maxillary arch is built, the action of the inclined planes will affect the size and shape of the maxillary dental arch as well.[1] In the older patient, in whom teeth are already missing and a replacement is contemplated, a choice may have to be made from three possibilities: a fixed bridge, a partial denture or a full denture.

In an adult dentition, although the loss of a single tooth may not affect the total dentition at once, it will produce a local deformity in a short time. In the case illustrated in Figure 4, the space after the loss of an upper central incisor was so large that a single replacement created a major restorative problem. In time, the lower anterior teeth grew up into the space and complicated the problem further. If root canal treatment had been made available to this patient, the whole series of events could have been avoided. The time has long since passed when root canal procedures could be looked upon as the occasional form of treatment. Complete care of the mouth requires that every effort be made to prevent the first loss of a tooth, whether the carious process extends to the dentin or to the pulp.

BASIC PRINCIPLES

Root canal procedures, which were challenged many years ago, led to the adoption of a completely sterile technic and, together with periodic roentgenographic check-ups, have proved to be a safe and useful measure in tooth conservation.

1. Hemley, Samuel, Fundamentals of Occlusion, Philadelphia: W. B. Saunders Co., 1944.

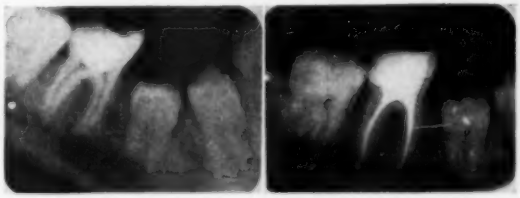

Fig. 3 • Root canal work on lower first molar in a developing dentition which will avoid sequence of events shown in Fig. 2

Fig. 4 • Major restorative problem presented by loss of upper central incisor. Further complicated by lower anterior teeth extruding into space

This fact has been further demonstrated in the literature by workers in this field. Success in this work seems to be facilitated by adherence to a group of basic principles.[2] Failures may often be attributed to the overlooking of one or more of the following: (1) proper selection of cases, (2) correct diagnosis, (3) asepsis, (4) correct and unobstructed access (5) removal of all tissue, (6) proper enlargement of canals, (7) when to use surgical intervention.

1. Proper Selection of Cases • The success of root canal treatment depends, basically, upon the proper selection of cases. In order to decide whether or not root canal work is feasible it is necessary that all the diagnostic aids available be employed. One or more roentgenograms should be taken at different angles to determine the following factors:

Amount of Bony Support • Teeth which are periodontally involved and in which the amount of bony support is insufficient, cannot be treated successfully. In the circumstances illustrated in Figure 5, not only the extreme curvature of the root but also the lack of supporting bone would preclude any attempt at successful root canal treatment. The health of a tooth does not necessarily depend on the pulp but rather on the periodontal structures.

Anatomy of the Canals and Pulp Chamber • Teeth whose roots are curved to the extent that root canal instruments cannot be introduced to the apex cannot be treated successfully. Also included in this group are lower bicuspids with two canals in which the bifurcation is halfway down the length of the root (Fig. 6). Although one may succeed in removing all tissue from these teeth, the difficulty begins with filling them, since one or the other of the canals will be blocked off and failure will result.

Periapical Bone Destruction • The extent of periapical bone destruction, whether it is the result of periapical infection or of neoplasm, is an important factor. When infection is present, the amount of bone destruction as well as the degree of necrosis of the cementum must be taken into consideration. Conservative root canal procedures alone, in these instances, may not yield a successful result. An excellent result achieved by means of root canal treatment followed by apical surgery is shown in Figure 7. Attempts to influence such a periapical condition by prolonged treatment through the root canals with drugs and antibiotics is not rational. Such periapical conditions in the presence of epithelial tissue produce damaging neoplasms, are a hazard to the patient's well-being, and should be treated

2. Auerbach, M. G., Factors for successful pulp canal therapy. New York Univ. J. Den. 6:213 (April) 1948.

Fig. 5 • Upper bicuspid with insufficient bone support and extreme curvature of the root and root canal. Root canal work would result in failure

Fig. 6 • Lower bicuspid teeth in which bifurcation is half way down the root. In filling, a canal will be blocked off, resulting in failure

surgically in order to produce a good and certain result.

2. *Correct Diagnosis* • Since our procedures with vital and nonvital pulp are radically different in management, correct diagnosis implies all of the foregoing factors and the determination of vitality. Here, the electric pulp tester is of great assistance but is not conclusive in its findings. The pulp tester should be supplemented by objective as well as subjective findings to form a sound conclusion.

3. *Aseptic Procedures* • The aseptic procedures and precautions necessary in this work need not be complicated or cumbersome enough to discourage root canal treatment. Once the armamentarium is assembled and placed in working order, it is maintained by the office assistant for instant use at all times. Any glass receptacle with a well-fitting cover will serve the purpose. The choice of germicide, however, should be carefully investigated. Certain products are slow in their action, requiring up to 30 minutes to destroy pathogenic bacteria; others may be entirely ineffective. Cold sterilization is recommended to preserve the working surfaces of instruments which are kept fully covered in one of the many safe solutions available.

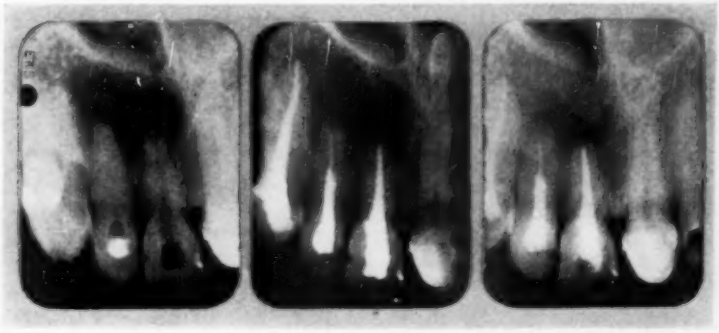

Fig. 7 • Shows the result of treatment in a case in which both root canal treatment and apical surgery were required

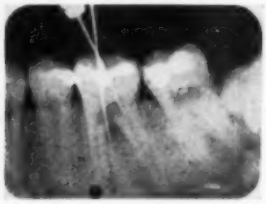

Fig. 8 • Illustrates failure of attempt to introduce root canal instrument through existing cavity

No root canal work should be attempted without the application of a rubber-dam. Broken down teeth, on which very little of the crown remains, should be protected by adapting and cementing a copper band or aluminum shell before proceeding. With this method, many teeth one would be inclined to sacrifice because of the condition of the crown will be found savable (Fig. 12).

4. Correct and Unobstructed Access • Perhaps the greatest single hazard in the more difficult cases is the operator's fear of not being able to find the canals, and to clean them out successfully after the tooth is opened. Upper molars usually have two buccal canals and one lingual canal. Lower molars usually have one distal canal and two mesial canals, one ...ated buccally and one lingually. Most ...e difficulty in the location of these ...s may be overcome, once the mesio- ...l cusp is removed by grinding it half ...lown the crown of the tooth. The ... thick buccal wall thus exposed is thinned out with burrs, after which complete visibility into the floor of the pulp chamber is possible. It will also be found that files and broaches can be introduced without difficulty. Any attempt to introduce root canal instruments through an existing cavity, as shown in Figure 8, can only result in failure and perforation. The importance must be borne in mind of creating the proper opening for the free, unobstructed introduction and removal of instruments.

5. Removal of All Pulpal Tissue • The incomplete removal of all tissue is perhaps most frequently responsible for failure in pulp canal therapy. The resort to powerful chemicals as an aid in tissue removal is emphatically not indicated. No modern surgeon would apply a powerful drug to living tissue which he expects to heal. The process of tissue removal is a mechanical one and cannot be accomplished by a few strokes of a root canal file or broach but rather by a slow meticulous procedure resulting at last in a clean canal.

6. Proper Enlargement of Canals • Canals into which one cannot successfully introduce root canal broaches, files and cotton points, should be progressively enlarged to accommodate at least a no. 3 Kerr file. The relationships in size of the no. 3 Kerr file, a fine barbed broach, the smallest cotton point and the no. 3 silver point are shown in Figure 9. Failure to enlarge canals to accommodate this series of instruments makes the removal of all tissue and the introduction of medicaments difficult and doubtful, and the resulting filling operation a foregone failure.

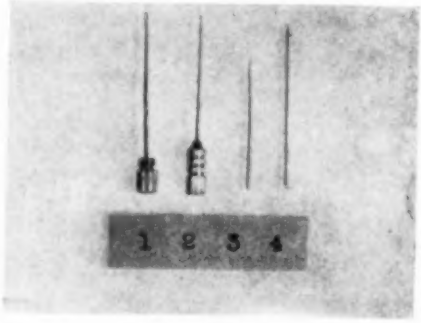

Fig. 9 • Illustrates relative sizes of (1) no. 3 Kerr file, (2) fine barbed broach, (3) smallest cotton point, and (4) no. 3 silver point

Fig. 10 • Upper left first and second molars, Case 1. Root canal therapy was performed through the bridge abutment, first molar

7. When To Use Surgical Intervention • In the presence of infection there is usually no connective tissue scar formation but rather a progressive breakdown of tissue with involvement of the peridental membrane, and the development of granulation tissue at the root end with ample evidence of root resorption. In the presence of a clean surgical wound there is first hemorrhage followed by the formation of a fibrin clot; organization of the fibrin clot results in connective tissue formation with complete healing made possible.

The decision to use surgical intervention is more often a conservative measure rather than a radical procedure. Antibiotic therapy is not a substitute for surgery. As a matter of fact, it may become effective only after an abscess has been drained. The Council on Dental Therapeutics specifically states its belief in the value of penicillin in dentistry, providing the use of this drug does not promote neglect or undue postponement of essential manipulative and operative procedures.[3] Hence, indicated surgical procedures should always be performed (Fig. 7).

3. Council on Dental Therapeutics. Report of the seventeenth annual meeting. J.A.D.A. 33:1045 (Aug.) 1946.

Fig. 11 • Upper right second molar in which attempt at filling with gutta-percha had failed. Root canals were filled with silver wires

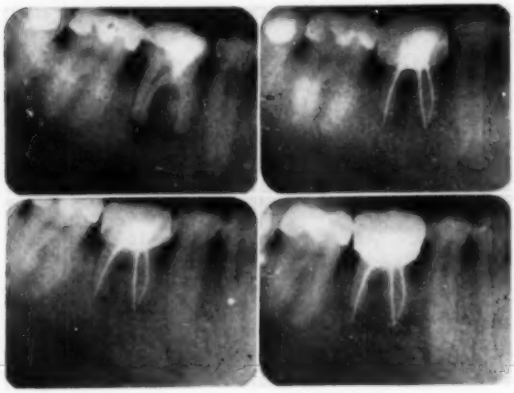

Fig. 12 • Shows excellent results of complete root therapy in lower left first molar (Case 3). Because of small area of remaining crown, work would have been impossible without careful protection by metal band or shell

TECHNIC

The procedures exemplified below are based on the mechanical removal of all tissue and organic matter, thorough flushing out of the canals with a mild antiseptic solution and the placement of nonirritating bacteriostatic dressings in the canals between visits. No emphasis is placed on any particular chemical or drug, as there is none yet available which will substitute for careful and complete removal of tissue.

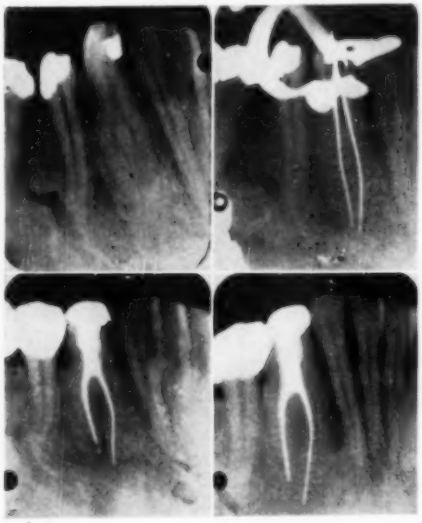

Fig. 13 • Lower right cuspid (Case 2) with two roots and two canals. In order to gain proper access to canals, crown was cut down. Root canals were filled with silver wires

Sterilization of the canals, prior to filling, is accomplished by mass irrigation of all canals wth Dakin's solution; in cases of nonvital pulp this may or may not be supplemented by ionic medication. The cases presented in this series, both those with vital and those with nonvital pulp, received no ionic medication. The Dakin's solution is made up fresh from tablets. A good assortment of stainless steel needles is recommended to facilitate getting the solution well into the canals. A needle which will not enter into the canal cannot possibly be expected to carry the solution where it is needed.

Filling Procedure • Canals that can possibly be filled with gutta-percha should so be filled as it seems to be the only safe material available that can be compressed and packed into the ramifications of the complex shapes of the canals in many of these cases.[2] Care should be exercised, however, not to overfill, but to fill just to the apex.

Where the canals are fine and curved as in bicuspids with two canals, buccal

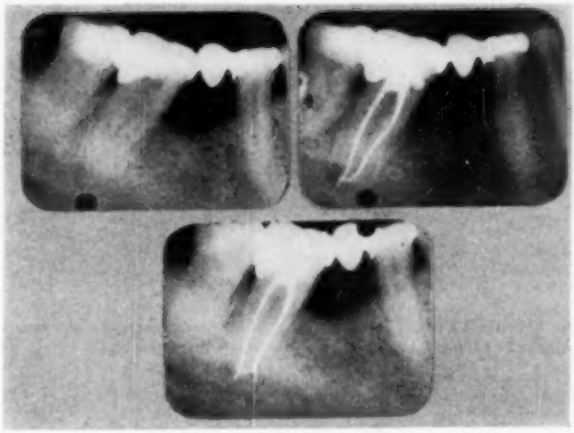

Fig. 14 • Lower left second molar (Case 5) in which root canal treatment with silver wires was performed without disturbing bridge

canals of upper molars, and the mesial canals of lower molars, silver wires are used as suggested by E. A. Jasper.[4]

CASE REPORTS

Case 1 • In Figure 10 are shown roentgenograms of the upper left first and second molars of a 20 year old woman. Failure to perform root canal work would have necessitated a unilateral partial denture. After root canal treatment of the second molar a bridge using the first molar as an abutment was constructed. The pulp of the first molars subsequently became involved. Root canal work with silver wires was therefore performed through the bridge abutment and the necessity for a partial denture was avoided.

Case 2 • Figure 11 illustrates the problem presented by the upper right second molar of a 35 year old man for whom loss of the tooth would have necessitated a unilateral partial denture. An attempt to fill the tooth with gutta-percha failed.

4. Jasper, E. A., Conservation of pulp involved teeth, J.A.D.A. 23:1895 (Oct.) 1936.

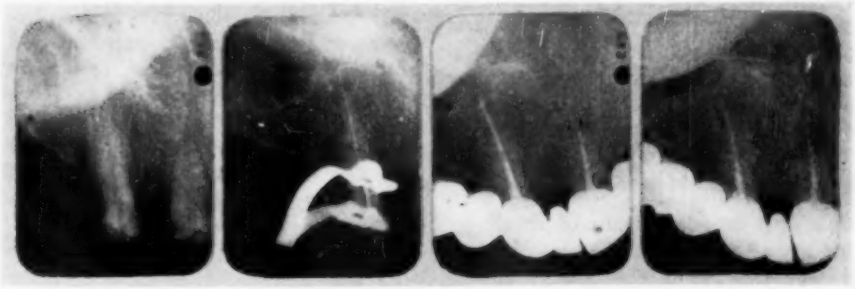

Fig. 15 • Upper cuspid and central incisor (Case 6) were filled with gutta-percha and chloropercha. Bridge work was constructed and has been in service since 1943

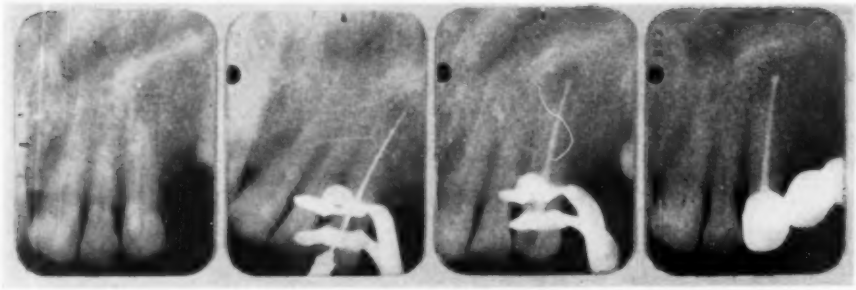

Fig. 16 • Nonvital upper cuspid (Case 7) which was filled with gutta-percha and chloropercha. Fixed bridge was then constructed and has been in service since 1940

The gutta-percha was therefore cleaned out and the four canals were filled with silver wires. This case well illustrates the strategic value of preserving such a tooth.

Case 3 • An attempt to perform pulpotomy of the lower left first molar of a 28 year old man resulted in failure. Tissue and infection left in the canals caused well advanced periapical destruction (Fig. 12). Complete root therapy was performed, the excellent results of which can be seen in the roentgenogram, and it was thereby possible to preserve the continuity of the dental arch and avoid construction of a bridge.

Case 4 • An unusual instance of a lower right cuspid with two roots and two canals was found in a 32 year old man. As can be seen in Figure 13, the tooth was strategically important and removal would have caused a major restorative problem. The canals were therefore filled with silver wires. To gain proper access, the crown was cut to within a few millimeters of the gum line.

Case 5 • A roentgenogram of the lower left second molar of a 38 year old man showed the presence of periapical destruction. Loss of this second molar would have meant the loss of the recently made bridge and its replacement with a new bridge using the third molar as a bridge abutment. Root canal treatment was therefore performed without disturbing the bridge and the canals were filled with silver wires with the result shown in Figure 14.

Case 6 • Figure 15 illustrates a case in which it was possible to preserve an upper cuspid and central incisor by filling the root canals with gutta-percha and chloropercha. The patient was a 55 year old man, and the strategic importance of these two teeth in the complete rehabilitation of his mouth was indisputable. After treatment, fixed bridgework was constructed, using the two teeth as abutments, and has been in service since 1943.

Case 7 • In Figure 16 is illustrated an upper cuspid, with nonvital pulp, of a 43 year old man. The loss of this tooth would have precluded fixed bridge work and resulted in a partial denture of questionable value to the patient. The root canal was filled with gutta-percha and chloropercha, and a fixed bridge was constructed using this cuspid as an abutment. The bridge has been in service since 1940.

1475 Grand Concourse

Naturally occurring stains on the teeth of children

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In the course of a study on dental caries in orphanage children, the opportunity was made available to conduct a concurrent survey on the occurrence of stains on the teeth of these same subjects. The entire study was being made through facilities of the State University of Iowa under the direction of Dr. Julian D. Boyd: the dental phases of the study at the time were under the guidance of Dr. Virgil D. Cheyne.

While much has been written with respect to the distribution, probable etiology, and possible significance of the green[1,2,3] and the brown[4,5] stains, little information is available regarding the relationship of the stains to one another. In the present study we have attempted a unified consideration of the various stains and their possible interrelationships, especially as to frequency of occurrence and relative distributions, both among different subjects as well as in the same mouth.

MATERIALS AND METHOD

The subjects for this study were children from five juvenile custodial institutions situated in a middle western state.

It was not practicable to examine all of the children in each of the five institutions, but representative samples were chosen at random from each age group in each institution. A total of 355 children (244 males and 111 females) were selected for study.

The mean age for all the children examined was 13.7 years, that for the boys was 14.0 and for the girls 13.1. The difference in age between the two sexes is probably not important. The age range for the entire group was from 4 to 20 years, and 85 per cent of the children fell in the group 11 to 17 years of age.

The survey consisted of careful and detailed examinations, with dental mirror and explorer, of the mouth and teeth of the 355 children.

All the stains were classified under five groups, according to color: green, brown, yellow, orange and black. The classification and methods for recording were suggested by charts in use in the Pedodontic Department at the State University of

This study was made possible in part through funds from the Sugar Research Foundation.

Eastman Fellow in Dentistry, University of Rochester School of Medicine and Dentistry, Rochester, N. Y.

Reported by title at the twenty-third general meeting of the International Association for Dental Research, Chicago, May 27, 1945.

1. Miller, W. D., Deposits upon teeth with special reference to green and metallic deposits, D. Cosmos 36:253 (April) 1894.

2. Ayers, Polly, Green stains. J.A.D.A. 26:3 (Jan.) 1939.

3. Springer, J., A clinical study of green stains. Tufts D. Outlook 18:30 (Dec.) 1944.

4. Pickerill, H. P., The Prevention of Dental Caries and Oral Sepsis. New York: Paul Hoeber, 1924, p. 263.

5. Bibby, B. G., A study of a pigmented dental plaque. J. D. Res. 11:855 (Dec.) 1931.

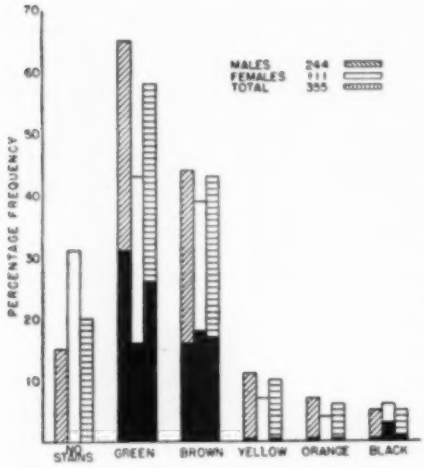


Fig. 1 • Frequency of staining according to color and sex. Solid portion of each bar indicates percentage of mouths in which only that color was found. Nonsolid portion represents mouths in which one or more of remaining four colors were also seen

Iowa for recording research data on oral conditions. Each dental arch was divided into three segments representing the areas occupied by the right and left posterior and the anterior teeth. Each segment was considered as a unit regardless of whether a full complement of teeth was present. No attempt was made, in the classification of the stains, to differentiate between the permanent and deciduous dentitions. Only stains present on the lingual or on the labial or buccal surfaces were recorded.

For evaluating the degree of staining on each of the surfaces, a four point scale was used to give relative quantitative values of the amount of surface area involved in each segment. The designations used were "1," "2," "3" and "4." An extent of "1" indicated a thin line, about 1 mm. or less in width, across the surface. Extents of "2" and "3" represented staining of one-third and two-thirds respectively of the entire gingivo-occlusal or gingivo-incisal width, while the designation of an extent of "4" was used in those cases in which the entire surface was involved.

FINDINGS

Frequency Distribution Among the Group • Of the total group of 355 children, 20 per cent were without detectable stains on their teeth. As shown in Figure 1, the sex ratio of nonstainers, in terms of percentage, is of the order of 2 to 1 in favor of the girls. At the time of examination 31 per cent of the girls and only 15 per cent of the boys were found to be nonstainers. Two hundred and eight boys out of a total of 244 (85 per cent) and 76 out of a total of 111 girls (69 per cent) showed staining by one or more of the five colors.

Green and brown were the predominant colors among both sexes, green having a somewhat higher incidence than brown. Yellow, orange and black were found in only a relatively small number of the children. Because of the lack of sufficient numbers of yellow, orange and black stainers, consideration of these stains will be kept to a minimum. Most of

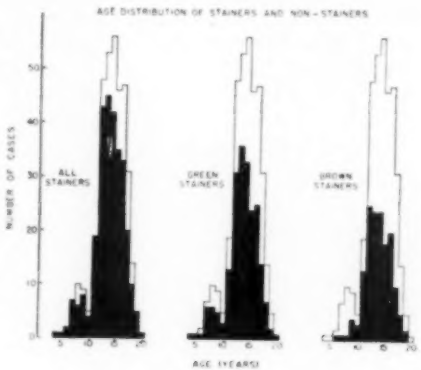
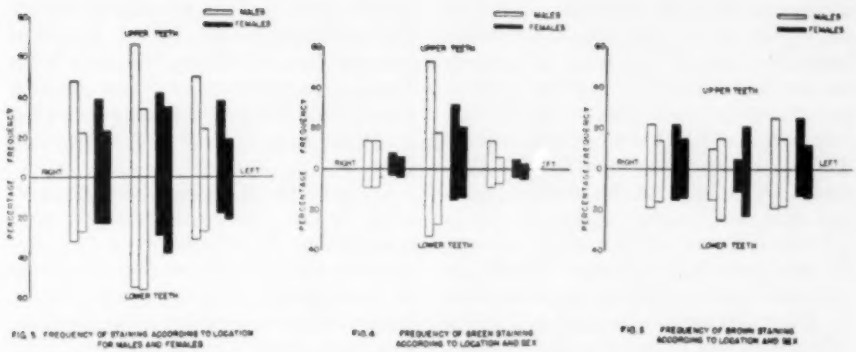


Fig. 2 • Distribution of stains according to age. Each graph shows total number of mouths examined in each group. Mouths with stains are represented by solid portion



Figs. 3, 4, 5 • Horizontal line demarcates upper and lower arches. Bars to the right of each figure represent left posterior teeth, those to the left the right posterior teeth, and the middle group the anterior teeth. The right bar of each pair represents labial or buccal surfaces, the left of each pair the lingual surfaces. All teeth in each of the six segments are considered collectivly. Open bars represent male and solid bars female subjects

our analyses to be reported will deal with green and brown stains.

There was a considerable difference in the incidence of green staining between the two sexes; this color appeared in 65 per cent of the male subjects but only 43 per cent of the female. Brown, on the other hand, was found with about equal frequencies in both groups. Similarly, sex differences in the incidence of yellow, orange and black were very slight.

In Figure 1 the bars for each color are divided into two segments. The solid portion of each indicates the percentage of mouths in which only that color was found. The nonsolid portion of each bar represents those mouths in which one or more of the remaining four colors was also seen. Thus, in slightly less than half the cases of green staining, green alone was found, and in the remaining cases one or more of the other four colors was present. The proportions are similar for both sexes. In the brown-stained group, 16 per cent of the boys showed staining by brown alone and 28 per cent showed the presence of one or more other color. The corresponding ratios for girls was 18 per cent brown stain alone and 21 per cent brown stain plus some other color, making a total with brown staining of 39 per cent of the girls. Yellow, orange and black, on the other hand, were almost always accompanied by some other stain.

The distribution of the stains according to age is shown in Figure 2. Each of the three graphs gives the total number of subjects examined in each age group and the number of these which had stains (solid portion). At all ages encompassed in this study the incidence of green was either the same as, or slightly greater than brown. At no age did the incidence of brown exceed that of green.

Distribution and Location Within the Mouth • The relative susceptibility of the various regions of the mouth to all stains is shown in Figure 3. Similar analyses for the colors green and brown are shown in Figures 4 and 5 respectively. In each of these three histograms the horizontal line demarcates the upper and lower arches. The group of bars on the right of the figure represents the left posterior teeth, the left group of bars

represents the right posterior teeth and the middle group indicates the anterior teeth. The right bar of each pair stands for the labial or buccal surfaces while the left bar of each pair stands for the lingual surfaces. All the teeth in each of the six segments are considered collectively. Open bars are for male subjects and solid bars for the females.

Little difference was noticed between the two sexes in the relative distribution of the stains in each of the segments when the five stains were considered as a group (Figure 3). For both males and females, the labial and buccal surfaces of the upper teeth seemed to be more susceptible to staining than were the lingual surfaces. In the lower teeth, however, both surfaces were stained with almost equal frequencies. Maximal frequency of staining for both sexes was found on the labial surfaces of the upper anterior teeth, and minimal frequency was observed on the lingual surfaces of the upper posterior teeth.

Green staining was seen mainly on the anterior teeth (Fig. 4), especially the labial surfaces of the upper ones. It was found infrequently on the posterior teeth. This was true for both sexes, although males showed a higher incidence of green staining in almost all areas of the dentition.

Brown, on the other hand, occurred with a slightly higher frequency on the posterior teeth in both sexes (Fig. 5); the highest incidences were on the buccal surfaces of the upper posterior teeth and the lingual surfaces of the lower anterior teeth, and the lowest incidence was seen on the labial surfaces of the upper anterior teeth. This is in direct contrast to the distribution of green where the highest incidence occurred on the labial surfaces of the upper teeth.

Extent of Surface Involvement • The term "extent" is here used to designate the gingivo-occlusal or gingivo-incisal width of the stain on the labial, buccal or lingual surfaces. It is a means of obtaining an approximation of the degree of staining in each of the recorded areas. The mean extents of staining are presented graphically for all the colors (Fig. 6), green alone (Fig. 7) and brown alone (Fig. 8).[6]

Considering all the five colors together (Fig. 6) the surfaces of the upper teeth appeared to be covered by stains to a somewhat greater degree than the lower. Surfaces with the greatest extent of staining are the labial and lingual of the upper and lower anterior teeth and the buccal of the upper posterior teeth. On the upper and lower anterior, and the lower posterior teeth, no great differences in the extent of staining of the labial, buccal and lingual surfaces were seen. Stains on the lingual surface of the upper posterior teeth occupied the least amount of the gingivo-occlusal distance, covering on the average less than one-third of that distance. This pattern is similar for both males and females.

The green stain was present to a somewhat greater extent on the surfaces of the upper teeth (Fig. 7). However, in both upper and lower jaw there was little difference in the extent of this stain between the anterior and posterior teeth, or between the labial or buccal and the lingual surfaces. Sex differences were likewise negligible.

Considerable variation was found in the surface extent of the brown stain (Fig. 8). Although this color was present more frequently on the posterior teeth, it covered somewhat smaller mean surface areas in these locations. In the lower posterior teeth both buccal and lingual surfaces were involved to a mean extent of 1.5. In the upper posterior teeth, on

6. It is to be remembered that our scale of "extent" does not give absolute values of the surface areas involved. The mathematical manipulation of averaging the figures for the extents is merely one of expediency for ease of presentation. The "means" thus obtained should not be considered to have any absolute value.

the other hand, the buccal surfaces were stained to a greater degree than the lingual, the mean values being 2.5 and 1.4 respectively. On the upper and lower anterior teeth the extent was close to 3 for both labial and lingual surfaces. Similar patterns of brown staining were found for both males and females.

Correlation with Caries • In addition to the presence of stains, the teeth were carefully examined for caries by means of the dental mirror and explorer. The total cumulative caries experience of each child was determined as the DMFT (decayed, missing and filled teeth).

A comparative study of the caries incidence between the stainers and non-stainers showed no significant differences. Those with no visible stains had a mean DMFT of 8.8, standard deviation 4.8, while the corresponding values for the stainers were 7.7 and 4.7. Standard error of the difference between the two means was calculated to be 0.634, giving a critical ratio of only 1.7. A level of significance is not considered to be reached until a critical ratio of 2 is obtained. Neither could any association between the amount of caries and the total extent of staining be demonstrated. The correlation ratio between these two factors was only −.018.

It is frequently stated that the green stain is associated with a higher incidence of caries whereas the brown stain is associated with a relative immunity to this disease. In order to test this hypothesis we have compared the caries incidence of those children who have green but no brown stain with those who have brown but no green. The mean scores were found to be remarkably similar in these two groups, being 7.7 and 7.6 respectively, with standard deviations of 4.8 and 4.2 respectively. This would indicate that neither stain is associated with dental caries. Decay of the teeth appears to occur just as frequently in mouths with brown stain as it does in those with green stain. In addition, caries scores for individuals with green and brown stain showed no significant deviation from those of individuals who exhibited no

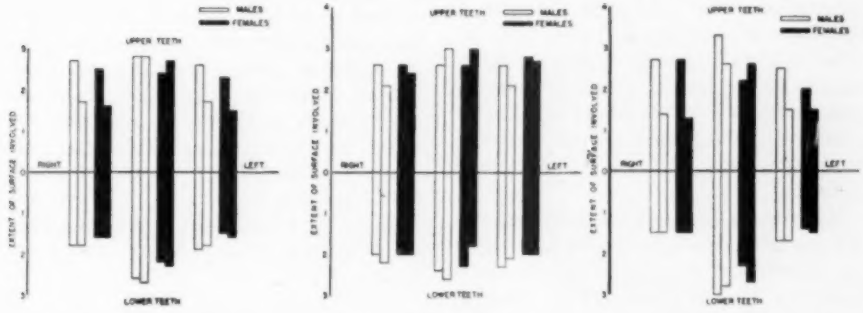


FIG. 6. MEAN EXTENT OF STAINING BY ALL COLORS ACCORDING TO LOCATION AND SEX

FIG. 7. MEAN EXTENT OF GREEN STAINING ACCORDING TO LOCATION AND SEX

FIG. 8. MEAN EXTENT OF BROWN STAINING ACCORDING TO LOCATION AND SEX

Figs. 6, 7, 8 • Horizontal line demarcates upper and lower arches. Bars to the right of each figure represent left posterior teeth, those to the left the right posterior teeth, and the middle group the anterior teeth. The right bar of each pair represents labial or buccal surfaces, the left of each pair the lingual surfaces. All teeth in each of the six segments are considered collectively. Open bars represent male and solid bars female subjects

Table 1 • A comparison of the caries scores of individuals showing no stains, one or more stains, green stain only, and brown stain only

Category	Number of cases	Caries score (DMFT)	Critical ratio
No stains	71	8.8	
vs.			1.7
one or more stains	284	7.7	
Green stain only	126	7.7	
vs.			0.15
brown stain only	68	7.6	

stains. These findings are summarized in Table I.

DISCUSSION

In this study we have omitted consideration of the many etiologic factors thought responsible for the deposition and accumulation of the dental stains. These have been adequately presented and reviewed by others. However, specific information on the frequency of occurrence and distribution of these stains, as well as the relationship which they bear to each other and to dental caries, are less available. It is with this latter group of points that this report deals.

A point of interest here is the difference between the sexes in the number of stainers and nonstainers. The greater incidence of male stainers may possibly be accounted for by the larger number of green stainers found in this group as compared with the females. With no other stain was such a large sex difference noticed.

That there are definite differences in the manner in which the various stains are distributed throughout the mouth is indicated by our results. The posterior teeth were found to be more frequently stained with brown while the anterior teeth showed a higher frequency of green stains. This predisposition of the anterior teeth, especially the upper labial surfaces, to green staining has also been shown by Ayers,[2] Springer,[3] and others. Investigations as to the etiology of dental stains and the possible effects these stains may have on the teeth should take into consideration not only these differences in the distribution of stains within different parts of the dentition, but the variations in the surface distributions as well. A point of interest here is the higher incidence of brown stains found on those surfaces contiguous to the openings of the major salivary glands. Whether or not this association is of any special significance in the etiology of this stain remains to be determined.

There is no agreement in the literature as to the relation between caries and staining. Ottolengui[7] has stated that he believes the green stain to act "destructively." Fox and Harris[8] have stated that the green stain "corrodes the enamel and disposes the teeth to become carious." Gramm,[9] Barrett,[10] and Miller[1] have stated their opinion that the destruction of the enamel precedes the deposition of the stain. Springer[3] also noticed that mouths with green stain were no more susceptible to caries. Ayers[2] found an association of dental caries and the green stain, but because of the greater frequency with which the labial surfaces of the upper anterior teeth are stained, and the lack of cervical (Class V) cavities in these areas, suggested that the stains may act as a protective covering for the enamel. Our findings showed no association between green stain and caries. We found no evidence that the stain acts as either a destructive or protective agent for the enamel.

There is a prevalent belief that the brown stain is associated with a relative

7. Ottolengui, R., Methods of filling teeth. D. Cosmos 34:701 (Sept.) 1892.

8. Fox, J., and Harris, C. A., Diseases of Human Teeth, Their Natural History and Structure. Philadelphia: Lindsay and Blakiston, 1855.

9. Gramm, C. T., The etiology and green stain. D. Cosmos 37:759 (Sept.) 1895.

10. Barrett, W. C., The classification of so-called green stain. D. Cosmos 37:764 (Sept.) 1895.

immunity to dental caries. Pickerill[4] has stated that the "mesenteric line" is found around the necks of the teeth immune to caries. Shourie[11] has shown that Indian children who have the mesenteric line have fewer carious permanent and deciduous teeth. He suggested that the mesenteric line may be of value in the prognosis of individual caries experience. Bibby,[5] in a study of 100 New Zealand individuals with the stain and 1,000 others without, arrived at a similar conclusion of the inverse relationship between dental caries and the brown stain. Bunting,[12] on the other hand, stated that he has found the mesenteric line described by Pickerill to be present "in mouths in which caries is very active."

Our own findings indicate that there is no difference in the caries experience of those persons who have the brown stain and those without it. To exclude the possibility that the green stain may complicate the caries picture in the brown stained group, only the brown stainers who showed no green stains were included. Similarly, in the green stained group, only those who showed green stains without an associated brown stain were considered. From our results it may be stated that, insofar as institutionalized children are concerned, there is no evidence that either the green or brown stain is associated with the caries experience of the child.

SUMMARY

1. Of 355 children, between the ages of 4 and 20, only 20 per cent were found to have no detectable stains on their teeth. The percentage of girls without stains was twice as large as the percentage of boys in this condition.

2. The stains were classified in a decreasing order of frequency of occurrence as green, brown, yellow, orange and black. Green and brown comprised by far the greatest number of stainers.

3. There was a higher incidence of green stainers among the males. No great differences in the sex distribution of the other stains was found.

4. The labial surfaces of the upper anterior teeth were found to be most frequently stained, while the lingual surfaces of the upper posterior teeth were the least frequently stained. Green was found most often on the labial surfaces of the upper anterior teeth whereas brown was seen most often on the buccal surfaces of the upper posterior and lingual surfaces of the lower anterior teeth.

5. No relation could be found between either the type or the degree of stains and dental caries.

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11. Shourie, K. L., Mesenteric line or pigmented plaque: A sign of comparative freedom from caries. J.A.D.A. 35:805 (Dec.) 1947.

12. Bunting R. W., A Textbook of Oral Pathology. Philadelphia: Lea and Febiger, 1929, p. 126.

Streptomycin for Europe • During its first year the United States Economic Cooperation Administration has financed the purchase of nearly nine million dollars worth of streptomycin for nations participating in the European Recovery Program. France is now receiving about 500 kg. a month, while the Netherlands is receiving about 41 kg. a month; shipments have also been sent to Italy, Austria, and Greece. E. C. A. is financing more than $500,000 worth of American equipment so that two French plants near Paris may produce streptomycin. *"News Notes," J. Internat. Coll. Surgeons 12:579, July-August 1949.*

The detection of carious lesions on the proximal surfaces of teeth

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A. Hallam Gresham,† B.D.S., Dunedin, N. Z.

Physical and roentgenographic examinations of the teeth of 416 patients were made concurrently in order to evaluate the two technics in the detection of carious lesions on proximal surfaces. The survey disclosed 3,389 cavities in patients ranging from 5 years of age to young adulthood (Table 1). The validity of the data obtained was checked by independent duplication of the physical examinations in over 200 of the cases, with almost exact correspondence in total findings. The mouth examinations were performed by several experienced operators participating at different times during the course of the survey, individual variations in efficiency of physical examination thereby being absorbed into grouped data. We believe the physical and roentgenographic findings represent the same level of efficiency in mouth examination as would prevail under very favorable operating conditions in clinics or private dental offices. An evaluation of examination technics is properly concerned with data assembled on that basis if it is to find application in practice.

Results are considered under three headings: (1) Comparative evaluation of physical and roentgenographic technics; (2) variability of the level of efficiency of the physical examination; and (3) influence of some specific factors on the efficiency of examinations for proximal caries.

COMPARATIVE EVALUATION OF PHYSICAL AND ROENTGENOGRAPHIC TECHNICS

The total numbers of cavities disclosed by physical and roentgenographic examinations are shown in Table 1. With the exception of maxillary anterior teeth in the group of young adults, the efficiency of the roentgenographic examination was found to be substantially superior to the physical examination, and relatively more stable. When expressed in a form which reveals the additional number of proximal lesions disclosed per patient on complementing physical examination with roentgenographic study, the results were as follows: Group I: 2.99 additional proximal lesions per patient in posterior teeth; Group II: 1.08 additional cavities per patient in anterior teeth, 4.37 additional cavities per patient in posterior teeth; and Group III: 0.77 additional lesions per patient in upper anterior teeth and 4.72 in posterior teeth.

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In the interpretation of results, the superiority of one or the other form of examination is not so important as the number or percentage of lesions which would have been overlooked if either method of examination had been omitted or not fully utilized. Even a single cavity, needlessly overlooked in its early stages, may prove sufficient to initiate disintegration of an intact dentition. It seems clear that physical and roentgenographic technics together provide the best and only adequate answer to the problem of thorough examination for detection of proximal caries.

We have found that an adequate roentgenographic examination of proximal surfaces calls for a minimum of (1) three small size no. 0 films to cover the upper anterior teeth and (2) four posterior bitewing films, two on each side of the mouth. The bitewing roentgenogram has not proved satisfactory for examination of anterior teeth because of the inevitable image distortion. This explains the recommendation for the use of small periapical films (Fig. 1). In the examination of posterior teeth, one film is used to cover the upper and lower bicuspid areas primarily, taking care to include the distal surfaces of the cuspid teeth (Fig. 1, below). Another film is used primarily for the molar area (not illustrated), for it has been shown repeatedly that all proximal surfaces of the posterior teeth cannot be shown satisfactorily on a single film on each side. This is partly due to limitations in the use of divergent radiation between approximately parallel surfaces some distance apart, and partly because exposure requirements cannot be satisfied at the same time for teeth of such widely varying buccolingual dimensions as bicuspids and molars.

VARIABILITY OF EFFICIENCY OF PHYSICAL EXAMINATION

A wide variation in the findings by physical examination from one operator to another prompted an illuminating experiment which could be duplicated in many individual cases. Two experienced dentists independently made careful physical examinations for proximal lesions in an adult dentition; subsequently a final diagnosis of proximal defects was arrived at by mutual consultation and agreement after roentgenograms had also been studied. The result depicted in Figure 2 illus-

Table 1 • Findings by physical and roentgenographic examination of proximal surfaces for caries

Case groups and region of mouth	Age range	No. of cases	Number of proximal cavities disclosed by each technic				Per cent of total proximal cavities disclosed by each technic		
			Total	Physical exam	Roentgenogram	Both exams	Physical exam	Roentgenogram	Findings common to both exams
Upper anterior teeth									
(Permanent dentition)									
II. Early adolescence	13-14	60	182	127	174	119	69.8	95.6	65.4
III. Young adults, median age 20.0 years	18-30	162	352	221	229	98	62.8	65.0	27.8
All posterior teeth									
Mixed dentition									
I Children, 194 cases, median age 7.5 years	5-8	156	1073	587	991	593	54.7	92.4	46.3
	9-13	38	206	104	190		50.5	92.3	
Permanent dentition									
II. Early adolescence	13-14	60	453	191	441	179	42.4	97.3	39.5
III. Young adults, median age 20.0 years	18-30	162	1123	322	1057	256	28.6	94.2	22.8

trates considerable variation between independent physical examinations, and also a possibility that sound proximal surfaces may be conscientiously but erroneously interpreted as carious.

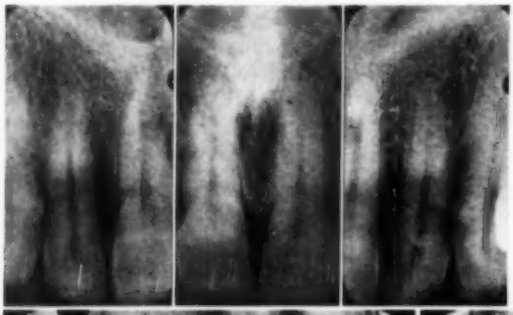
A single example cannot, of course, justify generalization; but it serves well to dramatize other findings based on adequately large groups of cases. Through several unselected component sections of a homogeneous group of cases, the numbers of lesions discovered by physical examination, expressed as percentages of the total numbers disclosed by physical and roentgenographic methods together, were reported in as follows:

Examiner C.....46.8 per cent
Examiner D.....56.2 per cent
Examiner A.....56.4 per cent
Examiner E.....62.7 per cent

In making a necessary correction for sound surfaces agreed to have been erroneously reported as carious, double the error was deducted on the assumption that for each such instance, some other surface happened to be correctly reported carious on no better evidence. This procedure placed the findings of the four examiners in a new perspective, confusing the order of their apparent efficiency as shown below:

Examiner C .....45.2 per cent
(46.8 per cent less 1.6)
Examiner A .....41.9 per cent
(56.4 per cent less 14.5)
Examiner D .....38.2 per cent
(56.2 per cent less 18.0)
Examiner E .....37.8 per cent
(62.7 per cent less 24.9)

These figures suggest that there may be some optimum level of apparent efficiency in physical examination, beyond which there tends to be a disproportionately large and undesirable error included.



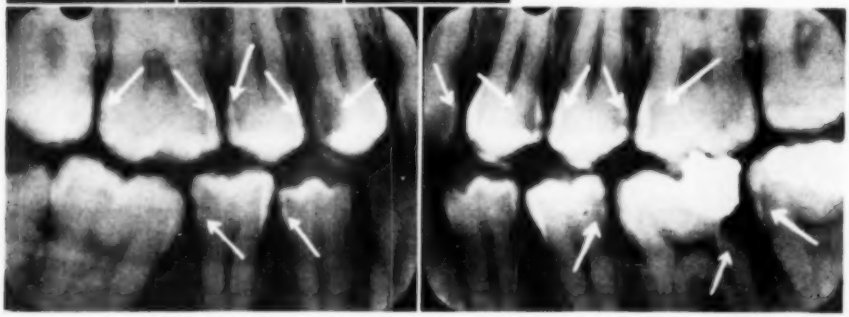


Fig. 1 • Above: Upper anterior interproximal examination, using three small-size (#0) films. Below: Posterior interproximal examination should include the distal surfaces of the cuspid teeth. Four films (two on each side) are required, of which only two are shown here

Surfaces Reported Carious	8| M	6| D	6| M	5| M	4| D	4| M	|3 D	|4 M	|4 D	7| D	6| D	6| M	|4 D	|5 D	|6 M
Final Diagnosis	●		●	●	●				●		●	●		●	●
Examiner I	◉		◉			X	X	X			◉	◉	X		
Examiner II	◉	X	◉	◉						X		◉		◉	◉
Roentenography	◉			◉	◉				◉		◉	◉		◉	◉

● = Final diagnosis of caries. ◉ = Correctly reported as carious.
X = Sound surfaces reported as carious.

Fig. 2 • Findings from two independent physical examinations and from roentgenographic examination for proximal caries in an adult permanent dentition, related to a final diagnosis arrived at by consultation with the original examiners

The constancy of the efficiency of given examiners, through two groups of cases whose dentitions were characteristically different, is shown in Figure 3. The results not only confirm variation in efficiency between operators as already discussed, but also reveal considerable (and in this instance opposite) variations in the level of efficiency of each operator on encountering a different type of case.

Applied in terms of practice, roentgenographic and physical examinations —each technic of acknowledged value for its own primary role in the disclosure of carious lesions—are seen to acquire new values as mutual checks for the validity of diagnoses originated by the other technic.

INFLUENCE OF SOME SPECIFIC FACTORS ON THE EFFICIENCY OF EXAMINATIONS

Further analyses of the data were made to study specific circumstances in which either examination might present unusual advantage.

1. Possibilities for thorough physical examination of proximal surfaces should be enhanced in cases characterized by some teeth being lost or missing from the dentition. Figure 4, left, shows the physical examination to have become more efficient as the number of lost or missing teeth increased; the efficiency of roentgenographic examination remained stable at a constantly high level. At certain age levels, many interdental spaces normally exist in the dentition, notably during transition from the deciduous to the permanent teeth, but study of the data by age groupings (Table 1) fails to indicate any age level at which either form of examination was completely adequate by itself.

2. The presence of restorative work in teeth could be expected to reduce the potential value of roentgenographic examination by obscuring proximal caries in some locations. This view is supported by reference to Figure 4, right (posterior teeth); and also by data for upper anterior teeth, in which for dentitions grouped according to increased numbers of restorations present, the physical examination increased in efficiency from a minimum of 46.3 per cent to a maximum of 65.9 per cent. Roentgenographic ef-

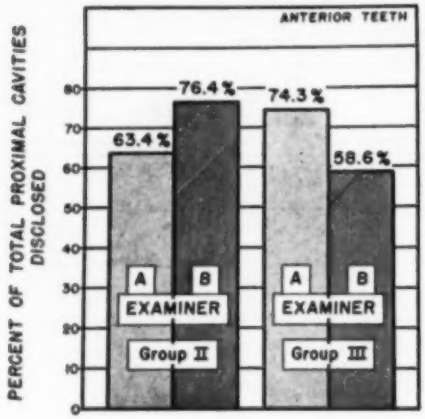


Fig. 3 • Comparison of findings by two examiners from physical examinations for proximal caries in anterior teeth of unselected cases from Group II and from Group III, shown as percentages of total cavities disclosed by physical and roentgenographic technics used together. In the one instance more cavities were disclosed by examiner B than by examiner A; in the other case the situation is reversed, illustrating the variability in efficiency of individual physical examinations. Group II: Examiner A (30 cases), 63.4%; examiner B (30 cases), 76.4%. Group III: Examiner A (48 cases), 74.3%; examiner B (122 cases), 58.6%

ficiency decreased concurrently from 80.0 per cent to 56.3 per cent.

3. Untreated proximal caries as compared with carious defects associated with proximal restorations were studied (see Table 2). The roentgenographic examination is seen to reach a higher level of efficiency in disclosing virgin lesions; the physical examination is, however, far from adequate for sole reliance in searching for carious defects associated with restorative work.

4. The extent of caries penetration into the tooth substance influenced the relative efficiency of the examination technics (Fig. 5). In interpreting the information in this illustration, it must be noted that for some cases in this group, numerous proximal lesions had been discovered by physical examination and treated within six months prior to the survey here reported. This fact does not affect a conclusion that the physical examination is conspicuously inefficient in disclosing beginning proximal lesions, and that it cannot by itself be relied on to discover all the deeper lesions. Indeed, a disturbingly large number of deep lesions remained to be disclosed by roentgenographic study, after physical examinations both prior to (in some cases) and during this survey. The deep proximal lesions revealed only by roentgenographic examination numbered no less than 1.98 per patient in this young adult group.

An extreme example of this type of case is illustrated in Figure 6, in which two deep carious lesions are shown, both of which eluded detection throughout three physical examinations. The explanation probably lies in the factor of the very narrow openings through the enamel making successful exploration unlikely between molar teeth with broad contact areas; in addition, the existing restorations contributed to obscure the reduced enamel translucency overlying a proximal lesion.

5. While on analysis of the data no region of the mouth emerged as offering possibility for effective study of proximal surfaces by a single examination technic, no data were obtained for mandibular anterior teeth. It is pertinent to emphasize the value of roentgenographic examination of maxillary anterior teeth (Tables 1 and 2) since physical exploration of the teeth supplemented by posterior interproximal films are too often regarded as fully meeting diagnostic requirements.

There was no indication of any situation in which either examination could routinely be considered adequate by itself. There are, doubtless, individual cases constituting exceptions, in which an examiner may be justified in assuming responsibility for dispensing with roent-

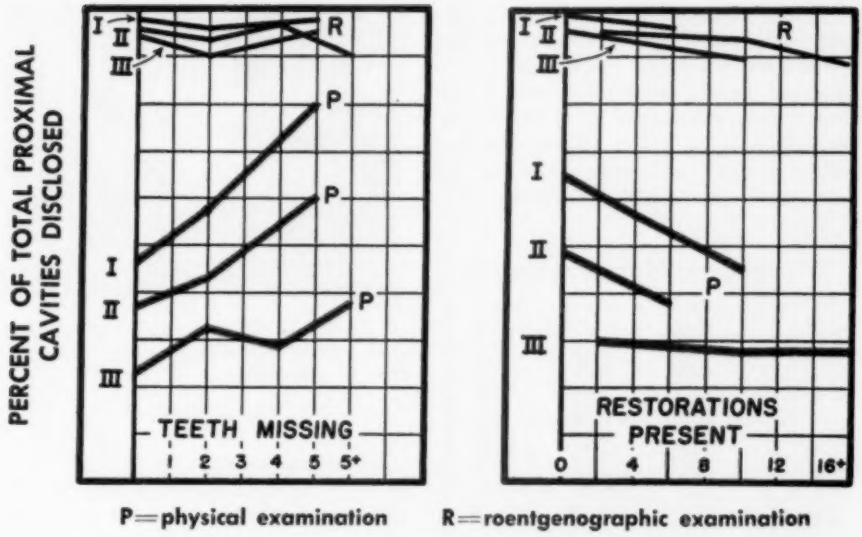


Fig. 4 • Influence of two factors on the relative efficiency of physical and roentgenographic examination for proximal caries in posterior teeth. Examination findings are shown as percentages of total cavities disclosed, for three groups of cases

genographic examination. But this approach would seem to be limited to the almost hypothetical case in which every tooth in the dentition would present an interdental space both mesially and distally, adequate to ensure certainty in visual inspection or exploration. It is safe to assert that the only diagnosis of proximal carious lesions adequately harmonizing with the philosophy of conservation of natural vital teeth will require to be based on both physical and roentgenographic technics of examination.

SUMMARY

1. Findings by physical examination were consistently less than those disclosed by roentgenographic examination.

2. There was surprising variation in physical findings for identical cases or strictly comparable groups as reported by different examiners. There was also wide variation in the efficiency of a given examiner on encountering characteristically different types of cases. It was evident that at the comparatively higher levels of apparent individual efficiency in physical examination, findings tended to include numerous sound surfaces erroneously reported as carious.

Table 2 • Results of physical and roentgenographic examinations in the case of (a) untreated proximal caries and (b) carious defects about restorations

Group III, 162 cases	By physical exam. (% of total disclosed)	By roentgenographic exam. (% of total disclosed)
Anterior teeth		
Virgin cavities	54.4	77.2
Defective restorations	84.6	33.7
Posterior Teeth		
Virgin cavities	25.9	96.8
Defective restorations	38.8	84.2

3. The efficiency of examination technics was studied in relation to specific conditions present in the dentition; for example, spaced teeth, the presence of restorations, the region being examined, the depth of caries penetration, the age of the patient, and caries recurrence as compared with untreated lesions. The physical examination varied in efficiency under these differing circumstances; the roentgenographic examination was characterized by remarkable stability in the level of its efficiency.

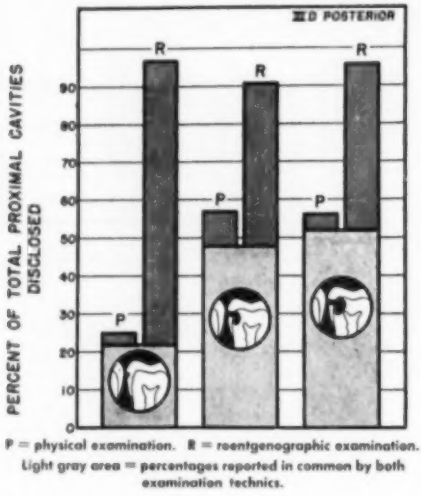


Fig. 5 • Percentages of proximal cavities disclosed by physical and roentgenographic examinations, related to depth of penetration of caries. The depth of caries penetration is indicated in the boxed diagrams at the bases of the columns

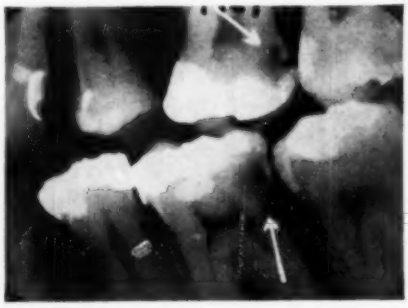


Fig. 6 • Two deep carious lesions which eluded detection through three successive physical examinations

4. Neither technic by itself proved adequate for effective examination in any of the circumstances studied. The two examinations are to be regarded as mutually complementary, the omission of either risking the probability that an important, if at times small, percentage of proximal lesions would fail to be disclosed. This applies to upper anterior teeth no less than to posterior sections of the dentition.

136 Harrison Avenue

Penetrating Wounds of the Joints • Wounds can be treated safely by fixation and extension in cases where chemotherapy can be administered. Similarly, extensive and even mildly infected wounds can be sutured per primam after adequate excision and surgical cleaning, provided that no tension exists on the suture line either in the deeper or superficial tissues, while delayed second suture in 48 hours can be carried out with impunity in the presence of adequate chemotherapy. *Philip H. Mitchiner, "The Surgery of Sepsis," J. Internat. Coll. Surgeons, 12:407, July-August 1949.*

Cases and Comments

A PHYSICAL LOCK OF THE TEMPOROMANDIBULAR JOINT

By Jerome M. Kramer, D.D.S., New York.

A 26 year old Puerto Rican woman came to this office complaining of pain in the right ear and inability to open her mouth. The patient had been wearing a neck brace for the past three months for a fracture of the fourth cervical vertebra with no injury to the jaws.

An attempt was made to have the patient open her mouth, which she did to the extent of one millimeter but with great pain (Fig. 1). This locked condition had appeared a few days before, after eating. She had consulted several eye, ear, nose and throat specialists who offered medication for her ear, but no improvement was noted. By this time the patient was hysterical and nothing more could be done at the first consultation, but prescribe a barbiturate to be taken at four-hour intervals and 50 mg. of Demerol Hydrochloride for her pain, to be taken when needed.

Upon examination the next day it was noted that the dentition was in harmonious interdigitation, which ruled out the possibility of subluxation of the mandibular condyle. There was pressure tenderness over the right temporomandibular area, and forward insertion of the index finger in the patient's right ear, with the patient attempting to open her mouth, produced exquisite pain in the joint. The slight condylar movement palpated plus the patient's history tended to make more remote the possibility of a bony ankylosis of the temporomandibular joint.

The etiology of this restricted movement of the jaw was unequivocal, for the maxillary relationships were normal and the patient's history disclosed no previous limited mandibular movement or temporomandibular discomfort. It was finally decided that the etiology was extraoral with emphasis placed on the neck brace. The most probable explanation of this condition is that the teeth were depressed in their sockets by pressure of the neck brace on the mandible. This depression of the teeth caused a loss of vertical dimension with a resultant compression of the meniscus from the right condyle due to a vertical, backward force delivered by the chin cup extension of the neck brace. This abnormal pressure on the condyle probably caused a disassociation of the meniscus, which is peripherally attached to the bony vault of the glenoid fossa. It is known that when the mouth is open the upper head of the external pterygoid muscle normally pulls the meniscus forward. Therefore, it was assumed that when the patient had attempted to open her mouth, the condyle had become wedged in a posterior relationship and locked.

The immediate treatment indicated was to relieve the locked condition of the condyle. The patient refused general anesthesia and muscle relaxation could not be attained. She was asked to open her mouth as wide as possible and a wedge was maneuvered in between the posterior teeth on the left side, making it possible to insert two tongue depressors between the posterior teeth on the right side. A sharp twisting motion exerted on the tongue depressors opened her mouth and released the locked right condyle. Two hard rubber, oblong erasers were placed into the newly created space between the posterior teeth on both sides of the jaws. This was done to relieve the condylar pressure and to

Fig. 1 • The patient as seen for the first time

prevent a recurrence of the locking. The opening of the jaw by the above technic confirmed the belief that the condyle was not in a state of bony ankylosis. The patient was sent home that day with instructions to apply a heating pad to both sides of the face at half hour intervals, and to massage the temporomandibular areas and lateral parts of the face with a mild wintergreen liniment every three hours. A warm saline mouth rinse was prescribed for use after each meal in addition to toothbrushing.

When the patient returned two days later, the hard rubber erasers were removed and replaced with cotton rolls. The patient reported considerable relief of ear pain and soreness over the right temporomandibular area. The patient's husband was instructed in the technic of removal and replacement of the cotton rolls before and after each meal, so that the patient could start chewing soft foods without any interference. During this visit a bakelite oral screw (Fig. 2) was employed with instructions to the patient to insert it between the posterior teeth on the right side of the jaw and to rotate it until a small amount of discomfort was experienced.

Fig. 2 • The oral screw

Fig. 3 • The oral aperture attained after treatment

She was to hold the oral screw in this position for a few seconds and then slowly unscrew it. This was done every two hours, each time attempting to open the jaw a little more.

The results were gratifying, for the aperture attained (Fig. 3) permitted the insertion of the terminal phalanx of the index finger. The patient was told to have the neck brace set screws adjusted in a semiloosened position and to insert two cotton rolls between her posterior teeth at bedtime. This measure was taken to prevent a relocking of the condyle due to the upward pressure exerted by the chin cup, especially with the patient recumbent. She was seen at weekly intervals, and a follow-up of one month revealed no recurrence. Further maintenance therapy in the form of a bite plate was planned, but the patient did not return, for she felt no discomfort and thought further checkups were not necessary.

Emphasis has not been placed on this condition resulting from the wearing of a neck brace. It would appear advisable, as a prophylactic measure, to utilize a bite plate in cases showing incipient signs of this complication. The cardinal signs to be watched for are ear pain, some temporomandibular tenderness, difficulty in fully opening the mouth and a numb, woody sensation felt in the teeth with the mouth closed.

650 West End Avenue

TEMPOROMANDIBULAR ARTHROGRYPOSIS WITH GINGIVAL INVOLVEMENT

By Samuel C. Miller, D.D.S., Professor of Periodontia, and Julius N. Obin, Instructor, Periodontia Dept., N. Y. U. College of Dentistry.

A white married woman 50 years of age appeared for examination at the Periodontia Department of New York University College of Dentistry in January, 1949. Her history revealed that in December, 1947, she had gone to her dentist who scaled her teeth. Upon returning home she noticed that her lower anterior teeth were very tender. At two subsequent visits the dentist applied acriviolet, but the pain continued. Several weeks later the gingivae became increasingly painful in the lower incisor region with a more generalized distribution of pain throughout the mouth including the upper jaw. Roentgenograms of the teeth were then made and the patient was told that her gums were in good condition. A physical examination by her physician in February, 1948 revealed no significant findings.

The pain continued to increase, assuming a definite pattern. Upon arising, no discomfort was present, but pain developed on speaking and was most marked after prolonged conversation. Relief was obtained during eating and sleeping. The pain was described by the patient as a sensation of tired muscles throughout the jaw and neck.

In April, 1948, the patient was referred to a neurologist who prescribed treatment for a possible nerve condition. As the discomfort grew more intense, the patient became more discouraged and after two and one half months discontinued treatment. The patient's family was most upset and she herself began to wonder if the pain was not imaginary. She was sent to a hospital in September. There the chief neurologist examined her and said that nothing was wrong. A tonic was prescribed for a two week period but she experienced no relief. In November, the patient was referred to a consultation clinic of another hospital where she underwent a medical examination including basal metabolic rate, complete differential blood count and a sugar tolerance test. The results of these tests were within normal limits and emphasized the patient's good health.

EXAMINATION

At the College of Dentistry a full roentgenographic series and study casts were made. The roentgenograms revealed a generalized alveolar involvement with a hopeless prognosis for the lower right first molar. The prognosis of the upper posterior teeth was questionable. The occlusal relationship showed loss of vertical dimension and extreme wear of the dentition. The patient's centric occlusion, however, was rarely used. She had adjusted her functional relation and was biting in a protrusive or end-to-end position. Lateral plate roentgenograms of the temporomandibular joint relations in centric and protrusive positions showed little anteroposterior change in the position of the heads of the condyles. There was a mild gingival inflammation about the anterior teeth with deep pockets around the posterior teeth. A tentative diagnosis of temporomandibular arthrogryposis was made.

TREATMENT

The lower right first molar was extracted because of its extreme periodontal involvement and the following treatment was instituted: (1) scaling, (2) instruction in toothbrushing, gingival massage and interproximal stimulation, (3) occlusal equilibration, (4) curettage, and gingivectomy where necessary, and (5) porte-polishing. Although the gingival condition improved, the pain still persisted.

A temporary acrylic partial denture replacing the missing teeth and onlaying those present was constructed so that in the end-to-end relation, the posterior teeth would give support. The patient was instructed to wear the appliance day and night. She returned the next day and reported complete cessation of pain. Eight months elapsed and the patient reported no recurrence. Final restorations are now being planned.

DISCUSSION

Symptoms of temporomandibular joint disturbances most frequently reported are: pain within and about the ears, tinnitus or "buzzing," stuffy sensation about the ears, dizzy spells, tenderness to palpation of the joint, cracking or snapping sound of the joint, neuralgia, and burning or prickling sensation of the tongue, throat and side of the nose.

The basis for successful treatment of the temporomandibular joint syndrome appears to be the restoration of oral and associated structures to normal or as near normal relationships as can be attained. This not only suggests the importance of proper vertical dimension, but the considerations of functional occlusion. Most important, however, are careful diagnostic procedures, and studied judgment and treatment.

209 East 23rd Street, New York 10, New York

OBSERVATIONS ON METHYL-METHACRYLATE FILLING MATERIAL

By William H. Nitschke, D.D.S.

Some years ago the dental world was thrilled by the introduction of a new porcelain-like filling material, a silicate cement. Immediately, well made gold foil fillings, which were the acme of good dentistry at that time, were removed from teeth and replaced by the new cement. It was wonderful, until to the dismay of dentists and patients, pulps began to die. The new silicate cement made of natural minerals was found to contain cobalt and had the same devastating effect on live tissues as did arsenic.

This new material, however, was so revolutionary that chemists set to work and, by the synthetic production of the minerals used, soon produced a synthetic silicate cement without the dangerous chemical elements of the original. This was brought about only at tremendous cost to the public and with grief and loss of prestige to the dentist, owing not only to the lack of adequate trial and clinical checks but also to the avarice of the manufacturer and the gullibility of the dentist.

However, that did not end the trouble. The new filling material was used indiscriminately, not only for the restoration of the anterior teeth but also the posterior teeth. It was beautiful, but when used in occlusal restorations the filling material washed out interproximally with resultant food packing and recurrence of caries. This, coupled with the chipping and breaking of margins and enamel edges, led to another round of trouble.

History repeats itself. Through the recent introduction of the new methylmethacrylate filling material the dental profession is again falling all over itself to be the guinea pig for promoters who do not agree among themselves as to technic in manipulation or its effect upon tooth tissue.

Some dentists maintain that this plastic is of an entirely different material. It is an entirely different material certainly, but it has some characteristics in common with silicate cement and one is that they are both entirely radiolucent and therein lies the danger.

It has been our privilege to examine and check clinically and roentgenographically work done by dentists in all parts of the world. In some countries many dentists use silicate cements almost exclusively in the restoration of all teeth.

Many times in such cases we have found caries involving the pulps of several teeth in the same mouth which was impossible to detect without the removal of the filling material because the shadow made on the roentgenogram by a carious lesion in a tooth is indistinguishable from that cast by a radiolucent filling material. A periodical check, by roentgenograms and clinically, would mean nothing in such cases where radiolucent filling material had been used.

In the anterior teeth, where there has been a logical cavity preparation, with the roentgenogram and clinical examination by transillumination it is possible to make a fair deduction as to whether or not there has been a continuation of caries under the filling material. The outline of the radiolucent area or cavity outline in these teeth is usually quite well defined. In the posterior teeth, however, with usually a greater irregularity of the carious lesion and therefore of cavity preparation, it is impossible to distinguish the cavity outline from the possible carious area and a recurrence of caries cannot be detected in these cases without the removal of the filling material. There is no staining of carious tooth tissue, as is usually the case where silver amalgam has been used. Ocular examination and transillumination usually show no shadow or a change in the color of the tooth tissue, and the roentgenogram, as we have pointed out, is useless.

Considering the physical properties of methylmethacrylate, its use as a filling material in masticating surfaces of posterior teeth is contraindicated, or if used at all experimentally in such locations it should be only in cavities with strong walls and with a radiopaque lining. In any case it is still an experimental filling material.

SUMMARY

Methylmethacrylate as a filling material for use in the teeth is still in an experimental stage and in justice to the patient and for the protection of the dentist, it should be so used and described.

A radiopaque base should be used wherever possible in all cavities where Methylmethacrylate is to be used.

The Waldorf-Astoria, Park Avenue, New York 22, N.Y.

AUGUST 1950

LON W. MORREY, D.D.S., EDITOR

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Editorials

Dentists take leading role in defeat of Reorganization Plan Twenty-Seven

On Monday, July 10, 1950, Congress, for the second time in two years, refused to approve a Presidential reorganization plan to make the Federal Security Agency a Cabinet department. Opposing arguments on both occasions laid heavy stress on the fact that approval would mean a big boost to administration schemes for compulsory health insurance. On this occasion the House of Representatives vetoed Reorganization Plan 27 of 1950 by a vote of 249 to 71. The results of the voting are reported by the Council on Legislation on page 213 of this issue.

In this fight, as in the fight against Reorganization Plan No. 1 of 1949, the Association played a leading part. From the date on which the plan was transmitted by the President to Congress until the moment the final vote was taken, members of the dental profession worked hard to secure its defeat. Full credit, of course, goes to the 249 conscientious congressmen who overwhelmingly rejected the plan. A major part of the credit, however, must be given to the Association's Council on Legislation, its consultants, who are chairmen of the constituent society legislative committees, the officers of the constituent and component societies and the great majority of general practitioners who did such an excellent job in seeing that every member of Congress was fully informed of the dental profession's stand. Although representatives of the Association appeared before two Congressional committees and effectively presented rational arguments against the plan, it was the arguments presented by the practicing dentists and physicians, augmented by others truly interested in the health and welfare of the nation, that effectuated another setback to a national system of compulsory health insurance.

Chaos marks planning for 1950 White House Conference on Children and Youth

A Midcentury White House Conference on Children and Youth sponsored by the Children's Bureau of the Federal Security Agency is to be held in Washington, D. C., during the first week in December. It will be the fifth decennial conference of its kind since President Theodore Roosevelt initiated the first in 1909. Five thousand representatives of national, state and local organizations will be invited to the nation's capital to participate in this year's conference, the purpose of which is to "consider how we can develop in children the mental, emotional and spiritual qualities essential to individual happiness and responsible citizenship and what physical, economic and social conditions are deemed necessary to this development."

Plans for this year's conference have been under way since early last fall when President Truman appointed a national committee of 52 prominent citizens headed by Federal Security Administrator Oscar R. Ewing to establish over-all policies and erect the necessary administrative machinery. Dentistry, inadvertently or otherwise, was not represented on the national committee, an oversight vigorously protested by this Association. Following the protest a dental representative was appointed to one of the advisory committees and invited to attend certain of the preliminary planning sessions.

To those who have attended preparatory sessions of former White House Conferences the cacophony prevailing at the planning committee meetings of this year's conference is extremely disconcerting. Unless the discord can be dispelled soon the success of the December conference is doubtful. It is quite apparent that the "Rube Goldberg" administrative machinery fabricated by the National Committee has been unable, so far, to weave the objects and activities of the participating organizations into a purposeful pattern. Although representatives of those organizations who have participated in the planning sessions have expressed complete unanimity regarding the goals of the conference, they are far from agreement regarding the manner by which those goals can best be attained.

The nebulous nature of the program presented at a three day Advisory Committee session late in May, the preponderance of platitudes, the dearth of directives and the absence of clear-cut administrative procedures threw the representatives early into a state of confusion and engendered suspicion in the minds of many regarding the administration's ulterior motives for the conference. This was a logical suspicion, heightened by the musk of the recent National Health Conference which still hangs heavy in the air and causes many private organizations to tread warily lest they become involved in another federalized program.

Despite its unauspicious start, however, its creaking, cumbersome machinery and the apprehension with which it is viewed by many, the Midcentury White House Conference on Children and Youth will be held in December. Despite poor planning the December meeting should provide leaders in child welfare activities with an opportunity to meet together and exchange ideas. Out of the speeches of the oratorically inclined and out of the resolutions presented by the earnest will emerge, finally, another report of a White House Conference.

Can a conference attended in such good faith by so many leaders result merely in a report? Let us hope not. Let us hope that the enthusiasm fanned by the Con-

ference will remain burning even if it wanes slightly with time and the pressure of other activities when delegates return to their communities. Delegates earnestly hope that at the December conference order will have been brought out of the chaos of earlier meetings. They hope also that their common aim—the welfare of children and youth—will so far outweigh any ulterior motives that may lie behind the conference that there can be no room for government intervention. If this is so, the future citizens of this country will have profited from the Conference and delegates can look forward with confidence to the sixth conference ten years hence.

In the meantime this Association, like every other organization seriously interested in the youth of the nation, will continue to improve its services for children.

Fluoridation of public water supply now urged by research scientists

Twelve years have elapsed since H. T. Dean presented his report on endemic fluorosis and dental caries. More than ten years have elapsed since the theory was first advanced that the addition of 1.0 to 1.5 ppm of fluorine to communal drinking water might reduce the incidence of dental decay. The idea was so revolutionary that over five years passed before officials in a few cities could be induced to inaugurate a water fluoridation study.

Considerable courage was required of civic authorities to pioneer in these experiments since the field was entirely new, equipment and materials costly, and the toxicity of fluorine well known. As F. A. Bull states in his article, "Control of Dental Caries by the Addition of Fluorides to Public Water Supplies," published in this issue of THE JOURNAL, early consideration of the artificial fluoridation of communal drinking water divided dental caries researchers into two camps: those who accepted presumptive evidence as conclusive and recommended the immediate treatment of communal drinking water with 1.0 to 1.5 ppm of fluorine, and those more conservative who advised waiting five, preferably ten years until the results obtained by a few carefully controlled fluoride studies could be evaluated. For the past five years, the controversy between the two camps has waxed warm. Recently data released by those in charge of the early studies seem to have brought the opinions of the two groups more closely together.

In October 1949 David B. Ast,[1] Sidney B. Finn and Isabel McCaffrey, reporting on the Newburgh-Kingston, N. Y., study, stated that after three years:

> The DMF rate for permanent teeth shows a constant downward trend in Newburgh from 21.0 to 14.8 per 100 permanent teeth. This indicates a saving of 6.5 permanent teeth per 100 in Newburgh as compared with a rate of 21.3 per 100 in Kingston at the last examination.

The authors cautiously advise, however, that these data are preliminary and that the study must be continued until 1954 to 1956 in order to obtain additional information concerning the caries prophylactic value of fluorine.

Dr. W. L. Hutton,[2] medical health officer of Brantford, Ontario, Canada, reports that the addition of 1.3 ppm of fluorine to the drinking water of that city between 1945 and 1948 reduced the DMF rate among five year old children from 5.60 to 2.97, an improvement of 47 per cent.

F. A. Bull[3] reports that a survey of Sheboygan children made in 1949, following 44 months of adding fluorine to the drinking water, showed a 39.6 per cent reduction in the def rate of deciduous teeth among kindergarten children and a 24 per cent reduction in the DMF rate of fourth grade children.

In June 1949 the American Water Works Association,[4] after reviewing the results of several carefully conducted epidemiological studies on the relationship between fluoride occurring naturally in communal water supplies and the prevalence of dental caries, issued the following statement:

> In communities where a strong public demand has developed and the procedure has the full approval of the local medical and dental societies, the local and state health authorities, and others responsible for the communal health, water departments or companies may properly participate in a program of fluoridation of public water supplies.

On the 8th of June the State and Territorial Dental Health Directors,[5] meeting in Washington, D. C., passed the following resolution:

> Resolved, that the State and Territorial Dental Health Directors recommend the fluoridation of public water supplies for the partial control of dental caries, where the local dental and medical professions have approved this program and where the community can meet and maintain the standard required by the state health authority.

On the following day, June 9, Assistant Surgeon General Bruce D. Forsyth, of the United States Public Health Service, issued the following statement to THE JOURNAL.

> Preliminary data indicate a lowered amount of dental decay following fluoridation of the public water supply. Although evidence is rapidly accumulating, the control study now being carried on (in Grand Rapids) should be continued and others as may be necessary inaugurated.
>
> In order to utilize this preventive at the earliest possible moment, therefore, fluoridation of public water supply as a procedure for the partial control of dental caries can be encouraged subject to the approval of the state and local health authorities and the dental and medical professions.

It appears certain from the data compiled from the few controlled fluoridation studies now under way that the addition of 1 ppm of fluoride to community drinking water inhibits dental decay. In fact the reports warrant the assumption that the fluoridation of drinking water may, at the end of ten years, reduce significantly the incidence of caries.

Certainly the opinions of such authoritative bodies as the American Water Works Association, the State and Territorial Dental Health Directors and the United States Public Health Service should dispel any lingering doubt about the advisability of fluoridating communal drinking water, and they should open the way for all communities having a central water system to provide a simple, inexpensive measure which will partially protect their children from the ravages of caries.

The artificial fluoridation of drinking water, however, is not a cure-all; it will not protect children completely from dental decay, but it is a tremendous step forward in the profession's fight against dental disease and it will stimulate further investigation which will lead to a more complete solution of the caries problem.

1. Ast, David B.; Finn, Sidney B., and McCaffrey, Isabel, The Newburgh-Kingston caries fluorine study. I. Dental findings after three years of water fluoridation. Am. J. Pub. Health 40:716 (June) 1950.

2. The efficacy of "fluorine treated" water supplies as an inhibitor of dental decay. Report of the Fluorine Study Committee, Wisconsin State Dental Society. J. Wisconsin D. Soc., 26:6 (Jan.) 1950.

3. Bull, F. A., Control of dental caries by the addition of fluorides to public water supplies. J.A.D.A. 41:146 (Aug.) 1950.

4. The fluoridation of public water supplies, J. Am. Water Works Assn. 41:575 (July) 1949.

5. Statement provided by Bruce D. Forsyth, Assistant Surgeon General, U.S.P.H.S.

Council on Legislation reports on Reorganization Plan Twenty-Seven

On July 10, 1950, the House of Representatives defeated the President's Reorganization Plan No. 27 of 1950 by a vote of 249 to 71. The plan, if approved, would have made the Federal Security Agency a cabinet department under the name of Department of Health, Education and Security. The American Dental Association was opposed to the plan and its representatives testified against it in the House and the Senate before the Committees on Expenditures in the Executive Departments. The Senate did not have to vote on the plan, since it was defeated in the House, but the Senate committee by a vote of 6 to 3 recommended that the plan be disapproved.

The vote on the plan in the House is tabulated below. For convenient reference it has been arranged according to states.

THOSE VOTING TO DEFEAT PLAN

Alabama: Andrews, Battle, Boykin, de Graffenried, Elliot, Grant, Hobbs, Jones, Rains. Arizona: Patten. Arkansas: Gathings, Hays, Mills, Norrell, Trimble. California: Allen, Bramblett, McDonough, Nixon, Phillips, Poulson, Scudder, Werdell. Colorado: Aspinall, Hill, Marsalis. Connecticut: McGuire, Patterson, Ribicoff, Sadlak. Delaware: Boggs. Florida: Bennett, Herlong, Peterson, Rogers, Sikes, Smathers. Georgia: Brown, Camp, Cox, Davis, Lanham, Pace. Idaho: Sanborn. Illinois: Allen, Arends, Bishop, Chiperfield, Hoffman, Jenison, Jonas, Linchan, Reid, Simpson, Vursell.

Indiana: Crook, Halleck, Harvey, Jacobs, Kruse, Noland, Wilson. Iowa: Cunningham, Dolliver, Gross, Hoeven, Jensen, Le Compte, Martin, Talle. Kansas: Cole, Hope, Meyer, Rees, Scrivener, Smith. Kentucky: Bates, Chelf, Golden, Morton, Perkins, Spence, Underwood. Louisiana: Larcade, Morrison, Passman. Maine: Fellows, Hale. Maryland: Beall, Bolton, Fallon, Garmatz, Miller, Sasscer. Massachusetts: Bates, Goodwin, Herter, Heselton, Martin, Nicholson, Rogers, Wigglesworth. Michigan: Bennett, Blackney, Crawford, Ford, Hoffman, Michener, Potter, Shafer, Woodruff, Wolcott. Minnesota: Anderson, Andresen, Hagen, Judd, O'Hara. Mississippi: Abernethy, Rankin, Whitten, Whittington, Williams. Missouri: Cannon, Jones, Karst, Short, Welch.

Montana: D'Ewart. Nebraska: Curtis, Miller, Stefan. Nevada: Baring. New Hampshire: Cotton, Merrow. New Jersey: Auchincloss, Canfield, Case, Hand, Kean, Towe, Widnall, Wolverton. New Mexico: Fernandez. New York: Coudert, Cole, Gamble, Gwinn, Hall, L. W., Keating, Kilburn, LeFevre, Kearney, Macy, Pfeifer, J. L., Reed, Riehlman, St. George, Taber, Taylor, Wadsworth. North Carolina: Barden, Bonner, Chatham, Cooley, Doughton, Redden. North Dakota: Burdick. Ohio: Breen, Brehm, Brown, Clevinger, Elston, Hays, Jenkins, McGregor, McCulloch, Polk, Secrest, Vorys, Weichel, Young.

Oklahoma: Albert, Steed, Stigler. Oregon: Angell, Ellsworth, Norblad, Stockman. Pennsylvania: Corbett, Dague, Fenton, Fulton, Gavin, Kearns, James, Kunkel, Lichtenwalter, Lind, Morgan, McConnell, Rich; Scott, Hardy; Scott, Hugh D.; Saylor, Simpson, Walter, Van Zandt. Rhode Island: None. South Carolina: McMillan. South Dakota: Lovre. Tennessee: Davis, Gore, Jennings, Murray. Texas: Beckworth, Bentsen, Burleson, Gossett, Guill, Fisher, Kilday, Lucas, Lyle, Mahon, Poage, Teague, Thomas, Thornberry, Wilson. Utah: None. Vermont: None. Virginia: Ab-

bitt, Burton, Fugate, Gary, Hardy, Harrison, Robson, Smith. Washington: Holmes, Horan, Mack. West Virginia: Burnside, Hedrick, Kee. Wisconsin: Byrnes, Davis, Hull, Murray, O'Konski, Smith, Withrow. Wyoming: None. Total: 249.

THOSE VOTING TO SUPPORT THE PLAN

Arizona: Murdock. California: Douglas, Doyle, Engle, Havenner, Holifield, King, McKinnon, Shelley, White. Illinois: Buckley, Dawson, Mack, O'Brien, O'Hara, Price, Yates. Indiana: Denton, Madden, Walsh. Massachusetts: Donohue, Philbin. Michigan: O'Brien. Minnesota: Blatnik, McCarthy. Missouri: Bolling, Carnahan, Karsten, Magee, Sullivan. Montana: Mansfield. Nebraska: O'Sullivan. New Jersey: Addonizio, Hart, Howell, Rodino. New York: Buckley, Byrne, Celler, Davies, Dollinger, Gorski, Heffernan, Kelly, Javits, Keogh, Lynch, Multer, Murphy, O'Toole, Powell, Tauriello. Ohio: Burke, Crosser, Feighan, Kirwan, McSweeney. Pennsylvania: Barrett, Buchanan, Cavalcante, Eberharter, Flood, Granahan, O'Neill, Rhodes. Rhode Island: Forand. Utah: Bosone, Granger. West Virginia: Bailey, Ramsay. Wisconsin: Biemiller. Total: 71.

In this vote it was necessary that members actually be present on the floor and voting in order to achieve our objective; namely, the defeat of the plan. Ordinarily, a majority of those present at the time a vote is taken can determine the issue but with reorganization plans a constitutional majority of those elected to the particular house of Congress must vote to reject the plan. On this vote 108 persons abstained from voting or were absent and two voted "present." Of these two, McCormack of Massachusetts announced himself as for the plan and Miller of California announced himself as against. Forty-four persons were announced as "paired," which means that twenty-two would have voted to oppose the plan, if present, and a like number would have supported it. In effect all forty-four of these voted to support the plan since they were not present and voting. Thus the attempted "stand-off" of opposite viewpoints redounded to the advantage of the President's supporters. Had the vote been closer this could have made a difference. Of those who were "paired," the members announcing themselves as opposed to the plan were: Stanley, Whitaker, Graham, Gilmer, Jackson, Davenport, Nelson, Hardin, Winstead, Kerr, Lodge, Velde, Pickett, Pfeiffer, W. L., Boggs, La., Preston, Chesney, Frazier, Willis, Regan, Hebert, Richards.

Washington News Letter

The Far Eastern situation has abruptly shifted the spotlight from the Capitol to the Pentagon. Urgent and immediate needs for medical and dental officers are receiving foremost attention now, instead of ordinary peacetime health legislation. Spectacular as it was, the Congressional defeat on July 10 of President Truman's reorganization plan for establishment of a Department of Health, Education and Security was quickly forgotten amid the three Surgeon Generals' mounting appeals for volunteers.

Strengthening the military medical departments to support operations in Korea, fulfill requirements incidental to expansion of Army, Navy and Air Force and assume special responsibilities resulting from reactivation of Selective Service—that is the formidable task confronting the Department of Defense and its component branches. In spite of attractive terms offered to prospective volunteers, Pentagon officials were not optimistic, as of mid-July, over chances of sufficiently large numbers of dentists and physicians applying for active duty and within inner councils serious consideration was being given to involuntary induction.

A sidelight on the war picture, of timely significance, was the exodus from Washington late in July of high ranking military leaders to attend an international conference on field supplies and equipment in Montreal. Members of the delegation included Richard L. Meiling, Department of Defense medical director; Maj. Gen. Walter D. Love and Maj. Gen. George R. Kennebeck, respective chiefs of Army and Air Force dental services, and the Surgeons General of the Army, Navy and Air Force.

The reverses suffered by American troops early in the Korean campaign quickly re-oriented Congress to military-support requirements, making it evident that pending legislation on public health issues would be sidetracked unless it could be shown that enactment of such bills were essential to strengthen our fighting arm or to civilian defense. It was on this premise that Rep. Andrew J. Biemiller (D., Wis.) delivered a bristling speech on the House floor July 13, demanding enactment of Federal financial support to dental and medical schools on the ground that increasing professional output is a "must" in the interest of national security.

To support his arguments, he read numerous letters from medical and dental deans recommending Federal assistance and indirectly opposing the contrary position of the American Medical Association. The communications were from James M. Dunning, dean of Harvard School of Dental Medicine; S. D. Marshall-Day, dean of Tufts College Dental School; M. Don Clawson, president of Meharry Medical College, and Chancellor Robert Hutchins, of University of Chicago, among others.

"The minute we moved into Korea, the armed forces started to look for doctors, dentists and nurses," said Rep. Biemiller. "If the experience of World War II is repeated, and it is certain to be because of present shortages, the armed forces will never find as many as they need. And the ones they do find and take will be those whose services are fully needed by civilians."

The speaker stated that the American Dental Association "is on record for the bill" and commended leaders in medicine, dentistry, nursing and public health for their support.

Armed Forces

NAVY ASKS DENTAL OFFICERS RETURN TO ACTIVE DUTY; A.D.A. REPRESENTATIVES CONFER WITH DEFENSE OFFICIALS; NEW PAY

Because of the changing world situation and the expectant increase in the armed forces, the Navy is in urgent need of the services of reserve dental officers presently on inactive duty, according to Rear Admiral Spry O. Claytor, Chief of the Dental Division. Admiral Claytor has asked the assistance of Philip E. Adams, A.D.A. president, in notifying dental officers of the immediate need.

In a letter to Dr. Adams, Admiral Claytor said in part, "The Navy is now in urgent need of the services of reserve dental officers presently in an inactive duty status. It is desired that such reserve dental officers, of the rank of Commander or below, volunteer their services for extended active duty (12 months or more)." He also requested that the appeal be published in all A.D.A. publications.

Earlier, A.D.A. representatives went to Washington for conferences with officials in the Department of Defense and in the Dental Divisions of the armed forces. E. Harold Gale, chairman of the Council on Legislation, R. H. Friedrich, chairman of the Council on Federal Dental Service, and Francis J. Garvey, secretary of the Council on Legislation, conferred with officials at the Pentagon and with Norvin Kiefer, M.D., head of the NSRB section on civilian defense in relation to health.

The A.D.A. group explained to Dr. Kiefer and government officials that their purpose in coming to Washington was to ascertain the plans of the Department of Defense with regard to possible mobilization of dental manpower, and to learn in what manner the A.D.A. could be of assistance, so that a report might be made to the proper authorities of the A.D.A. with a view to extending immediate cooperation.

Under the Selective Service Act of 1950 all members and units of any of the reserve components of the United States Armed Forces may be ordered to duty without their consent upon the order of the President. Such duty could continue for a maximum of 21 months except in case of national emergency. Officers in the Dental Corps of the Regular Army, Air Force and Public Health Service who were on active duty on September 1, 1947, dental officers who, prior to September 1, 1952, may be commissioned in the Regular Dental Corps, and those dental officers of the various reserve corps (including the National Guard), who, subsequent to September 1, 1947, and prior to September 1, 1952, volunteer and are accepted for extended active duty for one year or longer are entitled to receive special pay of $100 per month in addition to their base pay and allowances.

This extra pay does not apply while a dental officer is serving as an intern, nor does it apply if a reserve officer is ordered to active duty without his own consent. The extra pay is contingent upon volunteer service.

Under the new pay system, a dental officer without dependents entering the

service for the first time as a First Lieutenant or as a Lieutenant (j.g.), would receive $358.88 per month plus his $100 allowance as a dental officer for a total of $458.88 per month. Similarly, an officer of the same grade with dependents would receive $473.88. An officer of the grade of Lieutenant (Navy) or Captain (Army) in the Dental Corps with more than six months but less than eight years of service would receive $559 per month with no dependents or $574 per month if he had dependents.

For purposes of computing longevity of service, whether commissioned or enlisted, either active or inactive (except training) duty is counted no matter what branch or branches of the service an officer may have served in from time to time.

At the ratio of two dental officers for each 1,000 men in the armed services, the three military branches may soon require an additional 1,200 dental officers to service the 630,000 new men needed to bring the armed forces up to authorized strength. Admiral Claytor, Maj. Gen. Walter Love of the Army, and Maj. Gen. George Kennebeck of the Air Force reported to the A.D.A. that dental strength in their respective branches is not quite at par. The Army and the Air Force Dental Corps could not offer an accurate estimate of immediate needs.

In the conference with Dr. Kiefer the A.D.A. representatives learned of the dentist's role in over-all civilian defense planning. Dr. Kiefer suggested that the A.D.A. be prepared to cooperate in the formation of plans regarding a procúrement and assignment service for dentists in the event of a full scale emergency. He agreed that dental needs of civilians had been largely ignored during the last war.

Plans are also being considered for the compilation of a master list of all dental personnel in America, and for the establishment of basic ratios between dental needs of military and civilian populations. Present plans, it was revealed, will call for dentists to assume a major role in civilian defense.

MARINES LOWER DENTAL REQUIREMENTS

The dental requirements for male enlistments and reenlistments (unlimited) in the U. S. Marine Corps have been lowered to allow a greater number of recruits to enter that branch. Rear Admiral Spry O. Claytor, Chief of the Naval Dental Corps, said that applicants must

Maj. Gen. Walter D. Love, left, is shown receiving his commission as statutory assistant to the Surgeon General from Maj. Gen. R. W. Bliss, Surgeon General. Watching the ceremony is Maj. Gen. Thomas L. Smith, the retiring Assistant Surgeon General.

have sufficient natural or artificial teeth to ensure satisfactory mastication. They must not require immediate dental prosthesis of any type or immediate dental treatment for gross infections.

Admiral Claytor asserted that the minimum requirement is an edentulous upper and lower jaw corrected with serviceable dentures. Dental caries and periodontal conditions are not cause for rejection unless sufficiently extensive to cause loss of teeth in quantity to require prosthetic replacements for restoration of masticatory functions.

BILL FAVORING V.A. DENTAL SPECIALISTS PASSES HOUSE

HR 8619, a bill designed to give dental specialists equal pay and parity to medical specialists in the Veterans Administration, passed the House of Representatives and went to the Senate as THE JOURNAL went to press.

If passed by the Senate, the bill would enable dental specialists to increase their salaries by 25 per cent of base pay, as is now the procedure in medical specialists' salary ranges.

A.D.A. Affairs

FEW ERRORS NOTED IN J.A.D.A. MID-CENTURY ISSUE

The special, MID-CENTURY ISSUE of THE JOURNAL which was published on June 1, was not without defects as is usually the case in a large project involving many people, editors and contributors living many miles from the central point of activity.

Readers have brought to the attention of the editorial staff several errors relating to facts, spelling and typographical misnomers. In the section dealing with the history of periodical dental literature, on page 773, second column, paragraphs three and four became transposed. Paragraph three should have followed paragraph four under the title of "Dental Register."

In the history of *The Journal of Oral Surgery*, page 781, insufficient credit was given the Chalmers J. Lyons Academy of Oral Surgery for being instrumental in launching plans for a journal specifically designed for this specialty, according to word from J. Orton Goodsell, who was chairman of the committee in 1935.

In the biographical section, Philip A. Traynor (Delaware's outstanding dentist of the half century) was erroneously reported to have been graduated from the University of Pennsylvania Dental School in 1905. Dr. Traynor received his D.D.S. degree from the school in 1895.

A more unfortunate error was the fact that the biography of Richard L. Simpson, of Virginia, was written in the present tense. The material furnished THE JOURNAL did not indicate that Dr. Simpson had passed away several years ago.

Owing to limited space for each biography, many pertinent facts were not included. Attention has been called to the fact that perhaps the most significant phase of Matthew H. Cryer's life was deleted from his biography. The majority of Dr. Cryer's contributions to dental science were made after 1900 and after he had been appointed professor of oral surgery at the University of Pennsylvania in 1896.

Ernest W. Elmen, representing South Dakota, had his name spelled as "Elman" through an editorial error.

A.D.A. JOINS CHRONIC ILLNESS COMMISSION

The Board of Trustees of the American Dental Association has authorized A.D.A. membership in the Commission on Chronic Illness, and has appointed Allen

O. Gruebbel, secretary of the Council on Dental Health, as the Association's representative to the commission.

The commission was founded a year ago by the American Medical Association, the American Hospital Association, the American Public Health Association and the American Public Welfare Association. Its purpose is to serve as a national clearing house for the many organizations and programs concerned with chronic illness and the resultant disability.

RELIEF CAMPAIGN ENDS WITH HIGHEST YEARLY TOTAL

The American Dental Association Relief Fund Campaign for 1949-50 closed on July 1 with a total contribution of approximately $83,044, or 83 per cent of the quota established last November to make the highest total Relief Fund.

During June the Tennessee State Dental Association became the 15th constituent to exceed the quota set for it. State societies which have either met or exceeded their quotas are: Alabama, 217 per cent; District of Columbia, 156 per cent; Canal Zone, 137; North Dakota, 135; Southern California, 130; Georgia, 124; North Carolina, 113; New Mexico, 108; Hawaii, 104; Montana, 104; Utah, 103; Washington, 103; Tennessee, 102; Oregon, 102, and Louisiana, 100 per cent.

The nearest miss of the campaign was scored by members of the Mississippi State Dental Association who contributed $499.99 of $500 quota.

C. S. RENOUARD APPOINTED TO A.D.A. COMMITTEE

C. S. Renouard of Butte, Mont., has been appointed a member of the Advisory Committee to the Bureau of Economic Research and Statistics, it has been announced by Philip E. Adams, president of the American Dental Association.

Dr. Renouard fills the vacancy created by the death of Herbert E. King. Since it is an ad interim appointment, Dr. Renouard's term will expire at the annual session in Atlantic City, October 30.

A.D.A. RESEARCH ASSOCIATE APPOINTED TO BUREAU

The Council on Dental Research has employed Aaron S. Posner of Red Bank, N. J., as a research associate to work on the structure of tooth enamel, it has been announced by Harold Hillenbrand, American Dental Association Secretary. Mr. Posner will report to the A.D.A. Fellowship at the National Bureau of Standards around August 15.

Mr. Posner is a physical chemist, having received his undergraduate work at Rutgers University and graduate work at Polytechnic Institute of Brooklyn. He is experienced in crystallographic research, electron diffraction, electron microscope and other physical and chemical procedures. He is presently employed in the engineering laboratory of the Signal Corps at Fort Monmouth, N. J.

PROSTHODONTICS RESIDENCIES APPROVED FOR WALTER REED

Upon recommendation of the Committee on Interneships and Residencies, the A.D.A. Council on Dental Education has voted to approve straight residencies in prosthodontics at Walter Reed General Hospital, Washington, D.C., according to an announcement by Shailer Peterson, Council secretary.

The residency, the first to receive the Council's approval in military hospitals, embraces two years of study and clinical experience in the specialty of prosthodontia. Brig. Gen. Oscar P. Snyder, director, has stated that residencies in other specialties of dentistry will be established at Walter Reed and other teaching hos-

pitals. Approval of a general plan for dental residencies in other specialties in Army hospitals was previously given by the Council.

DENTAL BOARD LOCATES IN A.D.A. CENTRAL OFFICE

The files of the National Board of Dental Examiners, which have been located in the home of Gordon Teall, Hiawatha, Kan., secretary for the past eight years, have been transferred to the American Dental Association Central Office. The activities of the board will be directed by Shailer Peterson, secretary of the Council on Dental Education.

The move was attributed to the great increase of activities and numbers of examinations administered by the board as a result of nationwide interest in its work on reciprocal recognition of state dental licensing. The board's certificates, granted for successful completion of examinations limited to the basic sciences, are acceptable in 23 states.

Thomas M. Birkbeck, of Milton, Ore., is chairman of the council of the examining board.

Dental Societies

ALASKA PICKS ELMOE KASER AS FOREMOST DENTIST

Elmoe H. Kaser, pioneer dentist in the Territory of Alaska, has been chosen by his colleagues as the outstanding dentist of the past 50 years. Because of distance and other factors, news of Dr. Kaser's nomination did not reach THE JOURNAL in time to be published in the mid-century issue.

Dr. Kaser was graduated from Northwestern University Dental School in 1902, and practiced in Portland, Ore., until 1904, when he moved to Ketchikan, Alaska. In 1905 he opened an office in Juneau and was the only dentist in that city for many years. When the capital of Alaska was moved from Sitka to Juneau in 1912, Dr. Kaser was instrumental in writing the first Alaskan dental law which granted licenses to all territorial dentists practicing prior to the enactment of the law.

Dr. Kaser was appointed secretary-treasurer of the Board of Dental Examiners in 1915, an office he held until 1922 when he was named president of the board. He served in this capacity until his resignation in 1931. He continued to practice in Alaska until 1947 when he retired and moved to the state of Washington.

Dr. Kaser's retirement from dentistry left a host of friends and patients with deep regret that he no longer lives among them, but they feel that he has earned a rest after many years of devoting his untiring efforts to the betterment of dentistry in Alaska.

ILLINOIS HEALTH PROFESSIONS FIGHT POLITICAL MEDICINE

Dentists, pharmacists and physicians met last month at Springfield, Ill., at the first interprofessional rally on a state level to plan their campaign against compulsory health insurance legislation, and were told that "the professional man should apply the same zeal to political activity as he does to treating his patients."

Nearly 400 members of the Illinois State Dental Society, the Illinois State Medical Society and the Illinois Pharmaceutical Association heard R. B. Robins, physician, Democratic national committeeman from Arkansas and outspoken opponent of the administration's compulsory insurance scheme, who asserted that

it is the duty of individual members of the professions to stimulate political activity among their colleagues and patients.

The meeting was directed by William E. Mayer, Evanston, Ill., chairman of the state dental society's committee on federal health legislation. Ralph J. Gampbell, a former British surgeon now living in San Francisco, told the assembly of professional working conditions in England under the government health scheme, describing it as "like working in a sausage factory." A third speaker, Sen. Karl E. Mundt (R., S.D.) called upon all practitioners to fight "the spread of creeping socialism."

DENTAL HEALTH INSURANCE LAUNCHED IN NEW YORK

The first voluntary dental insurance plan in the United States, sponsored by a dental society, was launched last month in New York City. The plan, called "Group Health Dental Insurance, Inc.," was endorsed by the First District Dental Society of the state of New York.

Announcement of the society's approval was made by Oscar Jacobson, society president, and Bissell B. Palmer, secretary and administrative officer of the insurance plan. The project is designed primarily to meet the cost of adequate dental care for families with incomes of less than $5,000 annually. If the income exceeds that amount, Group Health will pay an idemnity toward the cost of the service. In its present form, the program will be limited to 25,000 subscribers for a two-year period. Annual premiums are expected to range from $19.50 for a single person to $72 for a family of three or more.

The plan will operate in two stages. The first, consisting of the correction of existing defects, is to be paid for by the subscriber at a favorable scale of fees. In the second, or maintenance stage, the company will assume practically the full

Free dental roentgenograms were offered by members of the Chicago Dental Society at a recent convention of the Chicago Rotary Club. Films were developed and mailed to visitors' family dentists who diagnosed and, if necessary, prescribed treatment.

During the 86th annual meeting of the Illinois State Dental Society in Springfield, May 8 to 11, an impressive ceremony was conducted when Philip E. Adams, president of the American Dental Association, placed a wreath on Abraham Lincoln's tomb. Listening to Earl O. Fay (far right), curator of the Lincoln Memorial, are (left to right): George E. Thoma, chairman of local arrangements; Paul W. Clopper, secretary of the Illinois society; L. W. Jacob, trustee, Eighth District, A.D.A.; Harold W. Oppice, president-elect of the A.D.A.; Dr. Adams; G. E. Cartwright, president, Illinois State Dental Society; W. J. Gonwa, president-elect of the Illinois society; M. E. Zinser, treasurer of the society, and James C. Donelan, publicity chairman.

Discussing the program at the Washington State Dental Association meeting held recently in Spokane were, left to right, Frank E. Wood, president of the Pacific Coast Dental Conference for 1951; M. R. Chipman, retiring president of the Washington association; Harold Hillenbrand, secretary of the American Dental Association, and Fred S. Shandley, A.D.A. Trustee for the Eleventh District.

George E. Weight (left), president of the Kansas State Dental Association, and Roy L. Felkner, president of the Missouri State Dental Association, are shown welcoming Philip E. Adams, president of the American Dental Association, to the Missouri-Kansas Dental Meeting. The meeting of the two state associations was held simultaneously in the Municipal Auditorium in Kansas City, Mo., from May 7 to 10.

Philip E. Adams (center), president of the American Dental Association, looks on as Albert A. McLaughlin, Bridgeport, Conn., chairman of the C.S.D.A. Award Committee, presents the Alfred C. Fones Memorial Medal to William J. Gies (right) of Columbia University. The presentation was made at the recent 85th annual convention of the Connecticut State Dental Association in Hartford, and was given Dr. Gies for his outstanding contributions to dental science.

cost for complete dental care for those in the $5,000 or less income bracket. Those in the higher income bracket will be partially indemnified. Practically all types of dental service are furnished and patients have free choice of any participating dentist.

N. Y. FIRST DISTRICT SPONSORS WORKSHOP BOOK

The Joint Dental Trade and Laboratory Relations Committee of New York's First District Dental Society has published a volume entitled "Leadership in Dentistry-Laboratory Relations," with material consisting of original papers presented before a recent workshop on that subject. Authors are leaders and active participants in the American Dental Association accreditation program in several states.

The book answers many practical questions and is intended to be a guide to build good will and harmonious relations between the dentist and the laboratory. Much valuable information is contained in the book, covering such vital issues as the cooperation of dentists and laboratories, laboratory accreditation, licensure and registration, amendments to the Dental Practice Act and accreditation plans for individual states.

The workshop, from which the book's material was gathered, was sponsored by the Dental Society of the state of New York and was conducted by the Joint Dental Trade and Laboratory Relations Committee of the First, Second and Tenth District Dental Societies, and was participated in by 10 neighboring dental societies.

The volume is expected to sell for $3.50 per copy, with checks made payable to Francis X. McHugh, Treasurer, Workshop Committee, Joint Dental Trade and Workshop Committee, First District Dental Society, Hotel Statler, New York 1.

D. C. DENTAL SOCIETY ANNOUNCES OFFICERS

Marcus H. Burton was elected president of the District of Columbia Dental Society during that organization's annual meeting in June, and John A. O'Keefe was named president-elect with E. Milburn Colvin, Jr., as vice-president. Karl Hayden Wood continues as secretary-treasurer.

Legislation

HEALTH COUNCIL SUPPORTS HEALTH DEPARTMENT BILL

The National Health Council, membership of which is made up of the major health associations in the United States, including the American Dental Association, has approved the Local

Health Units Bill, HR 5865 and recommended passage. The bill provides for the channeling of federal funds to local health departments, to be administered locally and requires only that basic minimum standards be met in the operation of local health departments.

The bill is currently on the docket of the House of Representatives, and members of all associations participating in the National Health Council have been urged to contact their congressmen in a recommendation for its passage.

NATIONAL CANCER INSTITUTE GRANTS $63,768 TO DENTISTRY

Delay in Congressional passage of the government's one-package appropriations bill for 1950-51, with consequent uncertainty as to the sums that would be allocated for Public Health Service research activities, was responsible for withholding of announcement of recommendations by National Dental Research Advisory Council on applications for grants. Although the council met in late June and acted upon the applications at that time, notifications were not expected to be sent out before the first week in August.

However, the National Cancer Institute had sufficient funds in hand to announce awards of $63,768 in continuation grants to 13 dental schools to support the programs which those institutions have developed for the training of dentists in the recognition of oral cancer.

Dental Education

JAMES H. PENCE NEW DEAN OF CREIGHTON DENTAL SCHOOL

Appointment of James H. Pence as dean of the Creighton University School of Dentistry has been announced by the Very Rev. William H. McCabe, S.J., university president. Dr. Pence's appointment fills the vacancy left last May by the death of Herbert E. King who had served as dean since 1945.

Most of Dr. Pence's career in dentistry has been with the Army Dental Corps, serving from 1923 to 1948, when he retired as a colonel. He was Chief of Dental Service for General Hospital 147 in the Pacific in 1942, and in March 1943 organized the dental clinic at Camp Ellis, Ill., the largest medical training center for overseas duty. Dr. Pence has 380 dental officers on his staff and supervised the treatment of 175,000 men in less than two years.

J. H. Pence

From 1944 to 1948, Dr. Pence was Chief of Dental Service at Percy Jones General Hospital, the largest convalescent hospital in the country. While there, he organized one of the first systems of dental interneships in the Army to receive approbation of the American Dental Association.

Dr. Pence received his D.D.S. degree in 1921 from the Kansas City-Western Dental College (now the School of Dentistry, University of Kansas City). He is a member of the A.D.A. and the Association of Military Surgeons. Since his retirement from the Army he has been

director of the Division of Oral Hygiene in the North Dakota State Department of Health.

DENTAL INTERNSHIP OPEN AT JEWISH HOSPITAL

A one-year dental internship is announced as available at the Jewish Hospital of Brooklyn, according to Mr. Paul Meyer, Jr., executive director of the hospital.

The hospital's dental service includes both out-patient and in-patient departments. The intern will receive special courses in pathology, radiology and anesthesiology. Financial remuneration, privileges and status are identical with those of the medical interns, including residence in the hospital for the full term of internship. The service embraces oral surgery, exodontia, periodontia and anesthesia.

Applicants should communicate with Mr. Meyer at the Jewish Hospital of Brooklyn, 555 Prospect Place, Brooklyn 16, N. Y.

PERIODONTOLOGY STUDY OFFERED BY COLUMBIA

Three postgraduate courses in periodontology are being offered by Columbia University's School of Dental and Oral Surgery of the Faculty of Medicine, with the first course to begin on September 20 and to continue to May 2, 1951, on a one-half day each week basis.

Another course will be scheduled for full time, from June 4, 1951 to June 15, 1951. A full time, two-year academic program leading to a certificate of training is also being offered, with emphasis on the correlation of fundamental sciences to clinical practice.

For further information, address Barnet M. Levy, D.D.S., Director, Postgraduate Division of the dental school, at 630 West 168th Street, New York 32.

TWO-YEAR SCIENCE COURSE OFFERED BY U. OF ILL.

A two-year, full-time postgraduate-graduate course in the basic sciences, with limited clinical experience, is being offered by the University of Illinois, through the Department of Oral and Maxillofacial Surgery.

The course will carry credit toward a Master of Science degree. Applications now are being accepted for September 1951.

Further information can be secured from the Department of Oral and Maxillofacial Surgery, College of Dentistry, University of Illinois, 808 S. Wood Street, Chicago 12, Illinois.

ORAL MEDICINE SEMINAR AT MINNESOTA, SEPTEMBER 21

The University of Minnesota School of Dentistry, has announced the fifth annual seminar for the study and practice of oral medicine, September 21 to 25. The purpose of the seminar is to bring into one fold men of research, teachers and practitioners in an attempt to correlate the fundamental health sciences with the practice of dentistry.

The program, offered through the university's Center for Continuation Study, will feature as lecturers eminent educators, clinicians and researchers. Further information may be obtained from William H. Crawford, Dean, University of Minnesota School of Dentistry, Minneapolis 14.

TORONTO UNIVERSITY LISTS CONTINUATION COURSES

The Faculty of Dentistry, University of Toronto, has announced a series of short intensive courses for dentists during the 1950-51 session. These courses will be arranged and conducted by the staff of the Faculty of Dentistry with the cooperation and financial support of the

W. K. Kellogg Foundation of Battle Creek, Mich.

These courses will be designed to provide the general practitioner with an opportunity to keep abreast of standard methods and procedures of practice and to learn of the most recent developments within the profession. Instruction will be given through lectures, seminars and clinical demonstrations.

Inquiries should be addressed to: The Dean, Faculty of Dentistry, University of Toronto, 230 College Street, Toronto, Ontario.

DENTAL TEACHERS OFFERED FOUR-DAY COURSE AT PENN

Teachers and clinicians of endodontics are being offered a postgraduate course in teaching methods by the School of Dentistry, University of Pennsylvania, according to an announcement by Lester W. Burket, director of postgraduate courses at the dental school.

The four-day course will begin on Monday, September 11, with an enrollment of 15, and will feature a teaching staff composed of seven of the school's educators. The fee for the course has been set at $75. Further details are available at Dr. Burket's office, 40th and Spruce Streets, Philadelphia 4.

ORTHODONTICS COURSE OFFERED BY OHIO STATE

The College of Dentistry, Ohio State University, has announced the addition of a new postgraduate course in orthodontics, with the first class to be admitted in October for the continuous 15-month study.

The graduate students will receive instruction in anatomy of the face and neck, oral histology, oral pathology, clinical orthodontics, basic concepts of orthodontics and orthodontic technics. The teaching staff will include E. G. Jones, H. B. G. Robinson, J. R. Hull, R. M. Kincaid, P. C. Kitchin, D. C. Miller, E. R. Wade and L. F. Edwards.

Ten applicants will be accepted on the basis of their academic records, professional accomplishments and aims. A certificate will be issued upon satisfactory completion of the course. Applications may be obtained from the Postgraduate Division, College of Dentistry, Ohio State University, Columbus 10, Ohio.

COURSE IN PEDODONTICS OFFERED BY U. OF CAL.

A five-day study course in pedodontics will be offered graduate dentists by the College of Dentistry, University of California, beginning August 14.

The refresher course, under the chairmanship of Charles Sweet, Jr., will consist of lectures, demonstrations and clinical practice. Almost every phase of dentistry for children will be covered during the week of instruction. It is expected that four such courses will be offered during each year.

The complete schedule and other details may be obtained from Gordon M. Fitzgerald, D.D.S., College of Dentistry, University of California, San Francisco.

Public Health

IDAHO CHILDREN SHOW EFFECTS OF FLUORIDES

After three years of fluoridization of the municipal water supply of Lewiston, Ida., findings were reported this spring by Walter J. Pelton, of Denver, district consultant of the United States Public Health Service, who found that the caries experience rate was substantially reduced.

Dr. Pelton, who was invited to assist the Lewiston dentists in surveying the teeth of the children in 1947 and again this year, said that the full effects of fluoridization will not be seen for a num-

ber of years but that preliminary findings are very encouraging. The caries rate for seven-year olds has been reduced from 1.4 teeth in 1947 to 0.6 of one tooth per child in 1950, a reduction of approximately 58 per cent, the most marked reduction. Children nine years old had a caries experience rate which showed a drop from 3.7 to 2.8, nearly one tooth, or approximately 25 per cent.

U.S. GRANT-IN-AID TO CALIFORNIA PROFESSOR

Department of State has announced the award of a grant-in-aid to David H. Grimm, associate professor of dental surgery at University of California, to enable him to serve as visiting professor of dentistry at the Central University of Venezuela, at Caracas, for a period of two months. He will leave for Venezuela early in August.

Dr. Grimm, a graduate of Loyola University Dental College, engaged in general dental practice at Provo, Utah, before entering upon graduate work at the University of California in 1935. He is a member of the American Dental Association, Northern California Society of Oral Surgeons and of the Oral Surgery Committee of the California State Dental Association.

International

BOLIVIAN SOCIETY RE-ELECTS PANEL OF OFFICERS

At a recent meeting of the Asociacion Odontologica Boliviana, the entire panel of officers was re-elected for the period 1950-51. Eduardo Quintanilla remains as president of the association and Juan Valverde Saavedra is vice-president. Hugo Perez Salmon was reelected secretary and Hugo Chacon Gonzales as treasurer. Voting members retained are: Ernesto P. Mier, Guillermo Krutzfeld, Rene Vaca Guzman, Mario Aguilar Zenteno and Jorge Plaza. The association's address is: Avenida Camacho 318, Casilla Correo No. 243, La Paz, Bolivia.

CONVENTION ON STOMATOLOGY IN ITALY, SEPTEMBER 26-30

The 25th Italian Annual Convention on Stomatology will be held at Stresa (Lake Maggiore) from the 26th to the 30th of September. The convention will be sponsored by the Italian Medico-Dental Association, an F.D.I. affiliate.

In addition to the daily meetings and scientific sessions, a large exhibit of dental journals, reviews, books and dental materials of all countries will be displayed.

General

A.D.A. PRESIDENT SPEAKS BEFORE A.D.T.A.

Philip E. Adams, president of the American Dental Association, addressed the recent annual meeting of the American Dental Trades Association at Dixville Notch, N. H., and emphasized that there is no greater area for cooperation between the two associations than in the fight against compulsory health insurance.

In making the statement, Dr. Adams said that such cooperation would be to great advantage in "this matter of preserving traditional methods of practice which have contributed so much to the high standards of American dentistry." Following Dr. Adams' speech, the A.D.T.A. voted unanimously in disapproval of the administration's proposed compulsory health insurance program.

The resolution said in part that: "We are convinced that a national program of compulsory health insurance would not contribute effectively to the improvement of the health of the public, but that, in

fact, it would tend to imperil the further development of medical and dental research, technic and practice, and would ultimately imperil the basis of our competitive enterprise system."

In his talk, Dr. Adams described some of the areas of misunderstanding between the dental profession and the dental trades, citing as an important point of friction, equipment, materials and technics which have failed to live up to advertising and promotional claims.

A.C.D. CONVOCATION IN ATLANTIC CITY, OCTOBER 29

The Atlantic City Convocation of the American College of Dentists will be held in the Claridge Hotel on Sunday, October 29. The meeting will consist of morning, luncheon, afternoon and evening sessions, according to an announcement by Otto W. Brandhorst, secretary.

MRS. H. W. OPPICE DIES AFTER BRIEF ILLNESS

The many friends of President-elect Harold W. Oppice were grieved to learn of the death of Mrs. Oppice, who passed away after a brief illness at their home in Lincolnwood, Ill., on July 15.

Mrs. Oppice is survived by her husband, a son, Robert W., a dentist who practices with his father, a daughter, Mrs. Ruth C. Miller, and two small grandsons, Thomas L. Miller and Harold W. Oppice.

DENTAL STUDENTS OFFERED $100 PRIZE FOR ESSAY

The Pan American Odontological Association has announced a prize essay contest limited to undergraduate dental students in North, South and Central America, with a $100 award to be paid the winner.

The theme of the essay should be a discussion of means of establishing better Pan American relations in the dental profession, on a subject to be selected by the author. The winning essay will be published in dental journals, after its presentation at the annual meeting of the Pan American Odontological Association in December.

Each essay may be written in the author's native tongue, under an assumed name, and presented to the dean of his dental school for transmission to J. A. Salzmann, New York, chairman of the essay contest. Entries should reach Dr. Salzmann not later than September 30. After selection of the prize essay, the dean of the school to which the essay is credited will be requested to identify the author so that the award may be made.

Further details of the contest may be obtained from Dr. Salzmann at 654 Madison Avenue, New York.

DENTAL ANESTHESIA SOCIETY IN SECOND MEETING

The Society of Clinical General Dental Anesthesia held its second annual meeting on June 14 at St. Vincent's Charity Hospital, Cleveland, Ohio, to watch anesthetic demonstrations by the hospital staff.

Members of the society, all graduates of St. Vincent's postgraduate course in general dental anesthesia, observed oral surgery performed under nitrous oxide and oxygen in addition to sodium pentothal.

The society voted to retain present officers for another year; Henry Hunter is president, Sidney Forman, secretary, and Vincent Castigrano, treasurer.

SURVEY SHOWS ADULTS LAX IN VISITS TO DENTISTS

In a recent poll conducted by George Gallup, director of the American Institute of Public Opinion, it was revealed

that 45 million out of 96 million adults have not visited their dentists in two years, 30 million have not been to a dentist in more than four years and approximately four million men and women have never received dental care.

Dr. Gallup's figures bear out the findings, on a more elaborate scale, of studies made by the A.D.A., which has long contended that 92 per cent of children and adults are in need of dental care, and that best oral health can be maintained by semiannual dental inspection.

The survey was conducted from coast to coast and indicated that a slightly higher proportion of women than men have visited the dentist within recent months.

A.D.H.A. MOVES OFFICES IN WASHINGTON

The American Dental Hygienists Association is now located at 1735 Eye Street, N. W., Washington 6, D. C. Miss Margaret E. Swanson is executive secretary of the association and may be reached at that address.

ANESTHESIA SOCIETY TO MEET IN NEW YORK OCTOBER 23

The fall meeting of the American Society for the Advancement of General Anesthesia will be held Monday evening, October 23, at the Shelburne Hotel, Lexington Avenue at 37th Street, New York.

Max H. Jacobs, Boston, will lecture on: "Oral Surgery Procedures as Influenced by Anesthetic Technics." The second speaker, M. L. Axelrod of Miami, Fla., will present a paper titled, "Increasing the Value of Nitrous Oxide with Trichlorethylene for General Anesthesia in Dentistry." Discussion will be opened by Samuel A. Brandon, of Portland, Ore.

The name and address of the society's executive secretary is: M. Hillel Feldman, D.D.S., 730 5th Avenue, New York.

MEDICAL ILLUSTRATORS' DIRECTORY AVAILABLE

Because of numerous requests from physicians, dentists and societies for information concerning the Association of Medical Illustrators, the locations and qualifications of its members, the association has prepared a complimentary publication to meet the need.

The directory issue of *Graphics,* official publication of the association, contains the name, address, training, professional experience and reference to major published work of each member. Other information pertaining to the profession is included.

The journal is available to those requiring medical illustration service, and will be sent free, upon request to the editor, Miss Helen Lorraine, 5212 Sylvan Road, Richmond 25, Va.

MELBOURNE ORTHODONTIST TO LECTURE IN NEW YORK

A two-day lecture course by John Heath, L.D.S., R.C.S., orthodontist, educator, lecturer and writer of Melbourne, Australia, will be given on Tuesday, September 26, and Friday, September 29, in New York, under the auspices of the New York Society for the Study of Orthodontics.

Interested persons should address inquiries to the society's secretary, Jack Perlow, D.D.S., 1777 Ocean Parkway, Brooklyn, N. Y.

International Correspondence

NEWS FROM GREAT BRITAIN

Three meetings of importance to dentists in Britain were held in July. Commencing on July 10 the British Dental Association held its five-day annual general meeting at Birmingham. H. T. Roper Hall, formerly president of the Public Dental Service Association and prominent in both the scientific and political sections of British dentistry, was installed as president of the B.D.A. Readers may remember his valuable paper on Incisive Canal Cysts. He is a lecturer on dental surgery for the Royal College of Surgeons of England, and recently was a member of the party which went to New Zealand to study the New Zealand dental nurse scheme.

Dr. E. Wilfred Fish lectured on "Dental Consultations" and Dr. Gosta Lindblom, of Sweden, read a paper on "Bite Analysis in Modern Dentistry." Prof. Brodie Highes discussed "Atypical Trigeminal Neuralgia" and Mr. A. J. Walpole Day spoke on "Orthodontics in General Practice." Dr. G. H. Leatherman opened the Thursday session with a paper entitled "Oral Hygiene." "Metabolism of Alveolar Bone" was discussed by Dr. H. Rogers and Dr. S. Weidman, and Dr. A. B. MacGregor closed the session with a paper entitled "Facts and Fancies in Dentistry."

On the following day, Friday, the annual meeting of the Fellows of the Faculty of Dental Surgery of the Royal College of Surgeons of England took place in London. After the meeting, the two annual lectures in memory of Sir Charles Tomes were delivered. Dr. Lester Cahn discussed the jaws in generalized skeletal diseases, and Prof. A. B. P. Amies, of Melbourne, spoke on "Epulides."

On July 23, the 50th anniversary of the F.D.I. was celebrated in Paris where the British Dental Association was well represented.

NEWS ITEMS

The Definition of Dentistry which was submitted by the Commission of Hygiene to the 37th annual session of the F.D.I. was accepted by the Representative Board of the B.D.A. This definition has been advanced by Dr. A. E. Rowlett and the Association expressed its gratitude to him on the occasion of adoption of the definition.

The representatives of the amalgamated B.D.A. have given evidence before the monopolies and Restrictive Practices Commission which is investigating the dental supply trade.

Recently Mr. Bevan stated that on January 1, 1950 there were 9,495 dentists on the dental list in England and Wales, and of these, 669 were assistants. The corresponding figure for Scotland on March 31 was 1,231 dentists of whom 110 were assistants. Before the war an assistant in dental practice in Britain was paid about 350 pounds per year ($980). Today, recently qualified practitioners are paid about 1,300 pounds a year ($3,640).

On June 8 the Whitley Council, which is constituted to consider the salaries of those dentists employed by local authorities to assume the dental care of school children, and for those patients attending the maternity and child welfare services, held its first annual meeting. At this meeting the constitution was adopted and claims for salaries and conditions of service were presented on behalf of the dentists. This presentation had been prepared by the B.D.A. The meeting terminated and the delegates were to reassemble in July to negotiate a scale to satisfy both sides of the council. The whole profession will be involved in the outcome and all await the decision anxiously. The school dental service may rise again steadily or it may go under for a very long time. The Whitley Council decision will be the determining factor.

Recently Mr. Bryan J. Wood was the recipient of his portrait in oils painted by one of the leading portrait painters in Britain today, Mr. Frank O. Salisbury. Mr. Wood, who has given great service to the dental profession and to the B.D.A. in particular, had held office as treasurer, and in 1937 was president. For nearly 15 years he has been editor of the British Dental Journal.

The literature on fluoride in our British journals is not comparable with that published in the United States, yet we believe that our contributions have some value. Dr. Weaver has recently published further information on the two towns of North Shields and South Shields. He has analyzed the results of the wartime diet and fluorine. In the nonfluorine town the D.F.M. deciduous teeth of five-year-olds was 33 per cent less than in 1943. In the equivalent age group in the fluorine town there was only a ten per cent decrease. In the 12-year old group, the conclusion is that: "When caries inhibition is produced by war-

time diet it does not apparently have that peculiarly selective effect on caries of the permanent incisors which is so constant a feature of fluorine areas."

John Boyes

GUATEMALA

Dr. Eduardo Caceres recently celebrated his 50th anniversary in practice, the first dentist in Guatemala to do so. He is a 1900 graduate of the University of California, and at 71 years of age is still an active member of Latin American organized dentistry. He was founder of the Guatemala Dental Society together with the late Dr. Rafael Robles in 1920. On the occasion of his 50th anniversary, he was honored by colleagues and friends. The Guatemala Dental Society had a Mass officiated by the Archbishop of Guatemala in thanksgiving. He was conferred the degree of Honorary Professor of the Universidad de San Carlos de Guatemala, the highest title that can be awarded by our institution of highest learning. Dr. Caceres also was awarded a gold and enameled remembrance medal from the society and a gold commemorative plaque by the Colegio Estomatologico.

NEW OFFICERS

At a recent meeting the new officers for the Guatemalan Association of Orthodontics and Relative Sciences were elected for a period of two years. The new president is Alfredo A. Morales; vice-president, Eduardo Garcia Salas; secretary, Enrique Estrada H.; assistant secretary, Ricardo F. Novales, and treasurer, Guillermo Caceres L.

Enrique Estrada H.

The Reader Comments

THE JOURNAL *devotes this section to comment by readers on topics of current interest to dentistry. The editors reserve the right to edit all communications to fit available space and require that all letters be signed. Signatures will be deleted before publication at the request of the author. Printed communications do not necessarily reflect the opinion or official policy of the Association. Your participation in this section is invited.*

The Editor

COLLEGE DISCRIMINATION

When a student with a top-notch record is rejected by a college Board of Admissions, he is usually given all kinds of explanations. Some of these explanations can be accepted as adequate. Quite frequently, however, such explanations are merely used as a smoke screen for racial, religious and national bias.

To expose and to find ways to abolish such undemocratic practices, a conference was recently held in Chicago which was attended by 100 of the country's leading college and university presidents, deans and registrars. The conference was sponsored by the American Council on Education and the Anti-Defamation League of B'nai and B'rith.

Twenty-six states and the District of Columbia were represented, ranging from Maine to Alabama, from New York to California. Delegates included 19 college and university presidents, 24 deans and registrars, five public school superintendents and principals, and representatives from 38 educational organizations and four government departments.

For two days, the delegates considered the problem of discrimination in higher education. Their findings, as well as their recommendations, I believe, represent a historical event in the struggle for a more perfectioned democracy.

The following three points were agreed to be basic areas for agreement: (1) on the basis of findings submitted, it was agreed that some colleges and universities do discriminate on grounds other than the ability and character of the applicant; (2) it was agreed that discrimination is dangerous and unjustifiable, as it cannot be reconciled with the Constitution of the United States, and (3) it was agreed that a National Conference of Educators could stimulate such action as would lead to the acceptance of and adherence to remedial programs, and that the members of this conference could formulate a statement of principles and a list of suggestions in regard to what might be done by individual institutions without the coercion of legislation.

The delegates not only examined discriminatory practices, but also a large number of rationalizations used to justify discriminatory practices. A close study of these rationalizations has been made by Dr. Robert Redfield of the University of Chicago in his incisive article, "Race and Religion in Selective Admission," *Journal of the American Association of Collegiate Registrars,* July 1947. Irving Ross and myself have also tried to examine these rationalizations in our study, "Religion and Race, Barriers to College" (*Public Affairs Pamphlet 153*).

Space does not permit the citation of all the rationalizations discussed at the conference, but I shall indicate a few: (1) colleges and universities must to some extent "play ball" with the nascent biases of the student body; (2) colleges and universities must "play ball" with pronounced community sentiments in order to maintain prestige and keep up morale among the students. In rejoinder it was pointed out that students in many cases behave much more democratically than their elders, and that if the students and communities display prejudicial attitudes, would it not be even more incriminating for colleges and universities to submit passively to such undemocratic sentiments and encourage them thereby?

Another common rationalization was discussed as follows: "It is just and logical to have quotas involving the same percentages as the racial and religious divisions in the general population." It was pointed out that such a rationalization cannot logically be maintained in a society which so eloquently devotes itself to the principles of individual initiative, free enterprise, and equality of opportunity. The report of the President's Commission on Higher Education states in this respect: "To insist that specialists in any field

shall be limited by ethnic quotas is to assume that the nation is composed of separate and selfsufficient ethnic groups, and this assumption America has never made except in the case of its Negro population, where the result is one of the plainest inconsistencies without national ideal, and "The quota system denies the basic American belief that men of all religious and racial origins should have equal opportunity to fit themselves for contributing to the common life."

Dr. Louis Wirth, professor of sociology at the University of Chicago, made a summarizing statement which was acclaimed by every educator present at the conference. He said: "We should confess the fact that discrimination is a broadly based, deep seated malady in our society; the answer is not to deny what is obviously a fact. The answer is not to hide the blemish upon our escutcheon. The answer is obviously in what we are attempting to do to remedy it; and if we can face the world and say to the people of other nations, particularly when democracy is on trial and has to establish itself by deeds rather than words, 'It is true that we have not lived up to our ideals and our creeds, but some of us are trying to do something about it.' That is the best answer and the only honest answer."

It is my opinion that the steps recommended for remedial action were of greatest significance. I wish to state here just a few of the conclusions arrived at by the conference were that: (1) questions which engender suspicion of discrimination be eliminated from application blanks and that each institution publish a clear, concrete statement of the admission procedures it follows; (2) all concerned with the problem of selection and admission expend every possible effort to develop educational programs that eliminate the use of unjustifiable criteria of admission; (3) additional studies be made to determine the extent to which barriers exist on undergraduate, graduate, and professional levels because of religion, race, and national origin, such studies to be sponsored by ACE, by Regional Accrediting Associations, etc.

(4) The results of this conference be brought to as many citizen groups as possible through: regional, state, and local conferences of faculty, alumni groups, and college trustees; discussion at meetings of professional organizations and among organized business groups as an approach to institutional trustees; full discussion with legislators at State and Federal levels, and effort on the part of the American Council on Education to encourage such discussion by its constituent members; (5) government financial aid (including student grants-in-aid) be increased to improve the quantity and quality of higher educational facilities so as to eliminate economic barriers; (6) present and future federal appropriations be given only to those professional and graduate schools which do not restrict for reasons of color, creed, or national origin; (7) continued study be made of the effectiveness of Fair Educational Practices Legislation in New York and Massachusetts to evaluate its worth for further application; (8) the "separate but equal" system of education in graduate and professional schools be discontinued; (9) professional organizations, which contribute greatly to establishing and maintaining high standards of professional education, take stands against discriminatory practices and open their membership without bias to all professionally trained persons, and (10) copies of the proceedings of this conference be given the widest possible distributions to all educational associations and all other groups that can be activated in the cause of eliminating inequality of opportunity in higher education.

I think it stands repetition that this conference in many respects was of true historical significance. This is true, not only because the conference was attended by a great variety of experts representing varying types of institutions and regions, but because throughout the conference there was a maximum participation by the delegates and all points of view were discussed in a truly democratic fashion.

A. C. Ivy, M.D., Ph.D.,
Vice-president, U. of Ill.

AMMONIATED DENTIFRICES

A great number of people in this country are under the false impression that the ammoniated dentifrices are panaceas. We must educate our patients to the truth.

Up to the writing of this article the American Dental Association, through its Council on Dental Therapeutics, has not accepted this belief. The A.D.A. has accepted only a few ammoniated dentifrices for clinical trial only.

We must educate our patients to the fact that good nutrition and proper mouth hygiene are still the two standards by which we judge the formation or eradication of tooth or gum disease. This is our rationale. They have been and still are the oral health standards by which we must all live if we wish to maintain for our patients a state of mouth salubrity. Insist on semi-annual checkups for young and old. Also, we must teach our patients that the continued use of carbohydrates (sugars and starches) is a great menace to our teeth —and is definitely the prime etiological factor in dental caries. Dr. Miller's theory of tooth

decay is still accepted by the dental profession. It has not changed one iota.

Inform your patients that whether they use the ammoniated dentifrices or the ordinary ones, they must be sure to thoroughly clean their teeth after each meal. This is a must.

If and when the time should come that the ammoniated dentifrices are accepted by the American Dental Association, tell your patients they will promptly be notified.

Charles A. Levinson, Brookline, Mass.

ON DIRECTING THE DENTAL PROFESSION

I am a relative newcomer to dentistry having been graduated from the University of Pennsylvania in 1948. However, there is one particular aspect of our profession which has become increasingly annoying to me as I become more familiar with it. I'm very curious to know whether I stand alone in my convictions, or whether there are other men who feel the way I do.

What I am referring to, is the large degree of dependence of dentists upon commercial organizations, such as laboratories and manufacturers, for so much of their work. To my way of thinking, this is a deplorable condition.

It is very disheartening to me when I visit the larger laboratories and find all types and all stages of prosthetic work intrusted to, in at least two cases I know of, grammar school graduates and other personnel with what I believe you once called "sublevel training." I see them designing partials with nothing more than a model to go by and I have also seen many other questionable technics. I have seen models sent by dentists to these men for "study." There is, not far from here, a man who will return an orthodontic appliance, complete with a typewritten page of instructions, to any dentist who cares to patronize him. His only stipulation is that the impression be either plaster or colloid and, of course, that the bill is paid. I don't imagine I could ever substantiate this with facts, but I consider the writing of "prescriptions" to the laboratories to be bordering on the farcical. I have actually seen dentists bring patients with "bad bites" into the laboratories. I would like to know if these practices are condoned by the average dentist. I would tell a patient I can't do the work rather than resort to such a procedure.

When is the dental profession going to run itself, instead of being run by those who serve it? Personally, I do all of my own laboratory work, with the ultimate goal in mind of a technician in my own office, but that is beside the point. I would like to know if anyone of consequence in the dental profession has noticed the same tendency to which I have referred? Do they feel about it as I do? Does anyone intend doing anything about it, or am I all wrong?

Current Literature

THE PROBLEM OF CHILDREN'S DENTISTRY

W. H. Littlefield. Lancet 258: 1011, May 27, 1950.

Under the National Health Service the disparity in fees for conservation of deciduous and of permanent teeth is no incentive to the practice of children's dentistry by a profession already swamped by the demands for service by adults. The result is a disastrous collapse of the School Dental Service.

After the war, the strength of the School Dental Service increased from the equivalent of 634 fulltime officers in 1946 to the equivalent of 921 by the end of 1947. However, six months after the start of the N.H.S. plan in July 1948, the number of school dental officers had fallen to a fulltime equivalent of 868, and since then the depletion has continued. At present less than one-twelfth of the profession is responsible for the dental care of children under 15 years of age who comprise one-fifth of the population. Parents are finding difficulty in getting dental care for their children by the busy private practitioners, with the result that teaching hospitals are being inundated and waiting lists grow longer.

Provisions for children's dentistry fall into two groups: (1) general dental attention for all children, (2) orthodontic treatment for those who need it. The ideal for the future is still to provide the largest part of the general dental attention of children by the School Dental Service. However, this will require an increase in the strength of the School Dental Service to the fulltime equivalent of 2,000 officers. In addition, the number of orthodontists must be increased to over 300.

An equable distribution of the dental profession on the basis of population would allot one-fifth (instead of the present one-twelfth) of the total to children's treatment, or 2,400 of the estimated practicing strength of 12,000. Since the present recruitment rate to the profession is insufficient even to maintain its strength, any increase in the number of dental school officers will curtail facilities for adults. The suggestion has been made that the problem might be solved by training dental nurses in the clinics to take care of the children. Under this plan, however, only the simpler types of conservation and extractions could be undertaken. More useful training for dental nurses would be possible in a dental school, but since present schools are working to capacity, a new school would have to be established. The question then arises whether to train dental nurses or fully qualified dental surgeons.

Since the training of a dental nurse takes two years and of a dental surgeon four, with the same facilities it would be possible to train more nurses than surgeons. On the other hand, fully qualified dentists would provide a more effective contribution than dental nurses to the treatment of children. The observations of the delegation examining the New Zealand dental nurse scheme should be awaited and brought to bear upon the factors involved in Britain.

The 300 orthodontists should be trained in the teaching hospitals and schools. After a year as house surgeon in a teaching hospital followed by the inevitable term of national service, training might consist of a return to the teaching hospital as a registrar, six months or so in the School Dental Service, an appointment as senior registrar in the orthodontic department of a teaching hospital and some time spent in the children's department of a nearby general hospital. A fulltime postgraduate course in orthodontics in some other teaching hospital or school at the end of this period would entitle the trainee to a special diploma.

Paddy Howes

FULL DENTURES:
A NEW AND SIMPLE TECHNIQUE

Alexander MacGregor, M.D., B.C.C. Brit. D. J., Vol. LXXXVIII:36. January 20, 1950.

Classifying full dentures into two parts; namely the anterior and posterior parts, Dr. MacGregor feels that esthetics is paramount as far as the anterior teeth are concerned and that function is important as far as masticatory efficiency is concerned in the posterior teeth.

In reproducing the anterior teeth, the author feels a high degree of artistic skill is required. However, the posterior arrangement necessitates mechanical ease. For this latter point, he prescribes the use of two contacting, flat, sliding planes made of acrylic blocks.

Not dismissing completely the accepted theories on balanced occlusion, the curve of Spee, and the anatomical articulator of the posterior teeth, he introduces these acrylic

blocks in sliding contact as easier forms on which occlusion is obtained, thereby allowing comfort to the patient. His aim is twofold: the first is that the patient should be able to move the mandible in all directions with an even slide of one denture upon the other without tendency to displacement; the second is that the action of one denture upon the other should be such as to produce a grinding and shredding action upon food.

His technic goes along with accepted theory of complete denture construction. Only in posterior tooth arrangement does he suggest the use of longitudinally grooved acrylic blocks in the posterior teeth of the upper denture and transversely grooved acrylic blocks in the lower.

With this method, Dr. MacGregor finds his patients react more favorably. Adjustments are made subsequently to regroove the dentures when the acrylic shows wear.

L. A. Varteressian

CANCER OF THE TONGUE

James English, Cmdr. (D.C.), U.S.N. Oral Surgery, Oral Medicine, Oral Pathology. February, 1949.

In this paper, the author attempts to convey the opinion of the majority of writers to whom he makes reference. That lesions are caused by irritation related to habitual pipe smoking and constant irritation by jagged teeth is given credence over the claim made by patients, that cause was due to accidental biting or a single burn. Lack of vitamin B should not be overlooked.

The most definite precancerous lesion is leukoplakia, though few cases ever develop into cancer. Syphilis is included because the lesion of the tongue bears a relationship to increased incidence of cancer of this organ among persons with syphilis.

Lack of early diagnosis is due to the absence of pain and the innocent appearance of the tongue lesion to the patient. The patient consciously notes the symptoms when there is a feeling of hardness, restricted mobility and the beginning of pain. The clinical symptom at this time, unless examination is relatively early, is a slightly raised lesion, indurated at the border and ulcerated.

Any persistent lesion of the tongue should be investigated. Early diagnosis is important in order to institute early treatment and assure favorable prognosis. The rich lymphatic drainage hastens early metastasis involving the deep cervical chain of lymph nodes and frequently the submaxillary and submental nodes. After metastasis, the prognosis is grave. In untreated cases, the duration of life may be from six months to one year. With treatment, 63 to 89 per cent of unselected cases may be expected to die of cancer in less than five years. Surgery may prolong life for thirteen months. Fifteen per cent may be cured. Thirteen per cent operative mortality may be expected. The cause of death may be pneumonia, cachexia, septicemia, suffocation, edema of the glottis, or hemorrhage. The most certain means of diagnosis is biopsy. The specimen should be wedge-shaped and include some bordering tissue.

Of the tongue, carcinoma is the most frequent lesion. The most common type in the anterior portion is the squamous cell variety. In the posterior portion, the transitional cell form of epidermoid carcinoma is frequent.

The most successful method of treatment is radium implantation in the primary lesion and complete surgical removal of the lymph nodes draining the affected side, with adjunctive roentgen therapy frequently advocated.

Two cases of squamous cell carcinoma are reported. The first patient was treated by roentgen rays and radium, with satisfactory regression of the lesion. Three years after the first oral symptoms, the patient died with monocytic leukemia. The second patient had a history of previous radiation therapy. The lesion was treated by surgical removal of two thirds of the tongue. Two and one-half months following, metastasis to the lymph nodes was present. Shortly after surgical treatment the patient died from a flare-up of an old tuberculosis.

C. Weil

TOOTH INFECTION AND SPINAL JOINT DISEASES IN MEDIEVAL DENMARK

Vilh. Moller-Christensen and Ove Brinch. Paradentologie #1. 1948.

A study was made of 250 exhumed skeletons of persons over 40 years of age and dating back to the Danish Middle Ages. Care and accuracy were exercised when the skeletons were exposed and removed so as to preserve all remnants including the teeth.

This paper was concerned with showing the remarkable correlation of spinal joint diseases with infected teeth occurring in these skeletons. The criterion for infected teeth was whether the pulp chambers had been opened either by rapid abrasion or carious processes.

In the 250 skeletons studied, 186 had infected teeth and 174 of this number had a spinal joint disease of some type. The patho-

logic changes in the vertebrae were classified as follows: (1) arthropathies in the intervertebral articulations which were manifested as marginal exostoses, perforated articulation surfaces, evidences of wide mobility of articulation and fistular canals. This process could result in osseous ankylosis; (2) arthropathies between the bodies of the vertebrae manifested very much like the above, and (3) spondylosis deformans with marginal exostoses excluding the articulating surfaces.

In the group of skeletons removed from the Aebelholt Monastery an opened pulp chamber or periapical bone resorption was found in 98 per cent of the cases with arthropathies of the cervical column. The authors designated this condition as Morbus Aebelholt and concluded that it was undoubtedly a common disease in the Middle Ages and offered good evidence for a true dental focal infection.

M. R. Holland

PROGRESSIVE ASYMMETRY OF THE MANDIBLE

W. B. Balderston. British Dental Journal, Volume LXXXVIII. Pages 25-28. January 20, 1950.

A case of progressive asymmetry of the mandible is reported, in which the progress of the condition can be followed by means of photographs from the age of 10 till operation at the age of 27½.

The overgrowth causing the asymmetry seems to have been confined to the condylar process, but there is no histologic evidence to suggest how the overgrowth was produced.

An interesting feature of the case is the adaptation to altered functional requirements shown by the increase of alveolar bone on the affected side, keeping the teeth in occlusion in spite of the constant tendency of the condition to produce an open bite on that side.

Russell K. Smith

THREE APPLIANCES TO AID THE ARREST OF DENTAL HEMORRHAGE

P. Felix. British Dental Journal. 88:32. January 20, 1950.

The question of dealing with patients requiring extractions, who are true hemophiliacs or have a definite hemorrhagic diathesis, is very complex and requires considerable preoperative care and preparation. The author presents three case histories of multiple extractions in known bleeders in which he used dental appliances to assist in the arrest of bleeding. The appliances were different in each case, one being constructed of silver, one of clear acrylic and one of impression composition material. In each case the sockets were packed with Oxycel gauze. The most unsatisfactory appliance was that constructed from composition material, but the author feels that it is of value even though primitive.

Heyl G. Tebo

NEURALGIA AND PARALYSIS OF THE HEAD AND NECK

Alex Sherman. Annals of Dentistry, 8:45. June, 1949.

Importance of differentiation between neuralgia, neuritis, and neurosis is pointed out, and five neuritides of interest to the dental field are listed. The discussion on neuralgia is approached from the standpoint of "major" and "minor" neuralgias. Trigeminal neuralgia, sphenopalatine neuralgia and glassopharyngeal neuralgia are dealt with as the major neuralgias. Their symptoms, diagnosis and treatment are discussed. The author discusses under minor neuralgias, neuralgia due to malaria, pain due to pulpitis, pyogenic infections or neoplasms as well as atypical neuralgias. A case history of an atypical neuralgia involving psychoneurotic and alveolar pain is presented.

The paralytic disturbances of the orofacial region are discussed, with the accent on Bell's palsy. Symptoms, diagnosis, treatment and prognosis of Bell's palsy are dealt with and one case history is given.

G. P. Gill

PREVENTION AND CONTROL OF DENTAL CARIES

B. Cohen. The Official Journal of the Dental Association of South Africa, 4:308. August 15, 1949.

This is a thorough review of the various methods which have been proposed as prophylactic and remedial methods in the problem of caries control. The subject is discussed in three parts: (1) alterations of tooth structure in attempt to render it impervious to factors responsible for the onset of decay; (2) inhibition of acid formation within the mouth; (3) neutralization of acids formed to render it innocuous.

The administration of fluorides systemically and topically is critically surveyed and mention is made of the zinc ferrocyanide impregnation procedure. The role of nutrition during the

prenatal period and the effects in subsequent dental health are also thoroughly discussed, and the newer concepts of enzyme inhibition and ammonium dentifrices are outlined.

J. C. Calandra

PRECISE EXAMINATION OF THE VOLUNTARY MOTILITY OF THE TONGUE AND OF THE LIPS

G. de Morsier and A. Rey. The Medical Press, 222:167. August 24, 1949.

Five cases of disturbed voluntary control of the structures involved in speaking and swallowing are presented, three of them in some detail. A labial and lingual dynamometer was used to record the forces that could be exerted by the lips or by the tongue. A glossograph (a rubber bulb placed between the tongue and the palate and connected to a diaphragm and writing lever) recorded the movements of the tongue.

These methods of appraisal revealed a variety of disturbances such as slowness in relaxation of the tongue, inability precisely to contract or immobilize the tongue, difficulty in the alteration of the intensity of pressure of the lips, and slow and jerky tongue movements. The author believes that disturbance of the motility of the tongue is the basis for pure motor aphasia or anarthria.

T. D. Speidel

PARTIAL DENTURE CONSTRUCTION; SOME ASPECTS OF DIAGNOSIS AND DESIGN

John H. Wilson. Dental Journal of Australia, 21:347. August, 1949.

A great contribution to the stability of a partial denture may be achieved by the use of indirect retention. Its main purpose is to control or prevent vertical or occlusal displacement of the denture. This not only aids the denture "balance," but also reduces the strain on the direct retainers or clasps, the supporting teeth and the soft tissues. Although an equal distribution of the denture design on either side of the fulcrum is the ideal, this is not altogether necessary or practical. Some form of indirect retention is necessary in the free end saddle type of partial denture. This can be accomplished by use of a continuous clasp, extension arms and rests, or extension of the denture base material across the fulcrum line.

In order to reduce the torque and the possible orthodontic effects of partial dentures, the author suggests the frequent use of stress-breakers, particularly in the free end saddle type of case. Since a stationary object (the retainer) is attached to a movable one (the saddle), the joints should be flexible. Thus the torque is not only absorbed, but there is less chance of occlusal overloading. The most effective stress-breaker is a wrought wire of high tensile strength, but care must be used in the selection of a wire with the proper physical properties for the case at hand.

A complete diagnosis is of greatest importance before the actual construction of a partial denture is begun. A roentgenographic examination is a necessity and will not only show the condition of the abutment tooth as to caries, periodontal lesions and vitality, but will give one a good idea of the bone architecture. This is very important because it is the base upon which the partial denture is to rest and may affect the prognosis of the case. Any intelligent partial denture work must be preceded by a thorough roentgenographic examination.

Arthur G. Freeman

THE PASSAGE OF A PATIENT THROUGH AN ORTHODONTIST'S OFFICE WITH ATTENTION TO THE LABIOLINGUAL TECHNIQUE

E. C. Lunsford. American Journal of Orthodontics, 35:636. August, 1949.

The author urges that an orthodontist's office should operate according to a definite plan in order to eliminate waste motion and time, to have the patient understand what is being done for him, and to accomplish a better service for the patient. The first step is to obtain adequate models, roentgenograms and history of the patient's health. Then the consultation with the patient and the patient's parents is held so that a clear understanding may be reached.

The author urges orthodontists to avoid overeagerness in the placing of mechanical appliances before the patient is adequately studied. To emphasize the possible advantages of a conservative approach, the author presents the models of two patients. In one of these patients two single lingual arch wires were placed and the four first bicuspids were removed. Succeeding models demonstrate how the labially placed cuspids have shifted distally into the bicuspid spaces. This treatment, coupled with a very short use of a plain labial appliance to assist in aligning the anterior teeth, completed the active treatment.

The second case demonstrates the author's use of the Oliver guide plane which was used to correct an excessive overbite and bring the

mandible forward so that the maxillary and mandibular teeth interdigitated correctly. He entitles this portion of the article, "Give them a chin."

The author states that when the mandible is brought forward with this appliance and the bite is opened on the anterior teeth, the posterior teeth will erupt until they meet and the patient can then be given biting exercises, still using the guide plane. He states that when the mandible is set forward and the bite is opened the function of the parts involved is changed. Roentgenograms of the temporomandibular joint are presented to show that the condyles are in a good relation to the glenoid fossa after treatment of this type. The author states that in this treatment the lower teeth are not moved anteriorly out of proper relation to the body of the mandible. Additional evidence, such as can be obtained from standardized profile roentgenograms before, during, and after treatment would have been helpful in presenting the effects of this treatment program.

T. D. Speidel

FACIAL CLEFTS AND THEIR SURGICAL MANAGEMENT IN VIEW OF RECENT RESEARCH

Wayne B. Slaughter, M.D., D.D.S., and Allan G. Brodie, D.D.S., Ph.D. Plastic and Reconstructive Surgery, 4:4. July, 1949.

Some combination of cleft lip or palate appears in one individual every 770 live births. It was thought that these should be corrected at an early age, in order that the following be obtained: (1) separation of nasal and oral cavities, (2) better feeding habits, (3) better development of the nose, and (4) facial esthetics. These objectives may have been obtained at the time of surgery but at puberty the results were not always satisfactory.

From recent research has emerged an exact method of measuring growth. By this method, cephalometric roentgenology, the direction and magnitude as well as the site of growth are determined. From these studies a definite growth pattern has been obtained. Congenital deformities do not deviate from this pattern.

From these studies it is suggested that there be no undue trauma or interference in blood supply to soft tissues. If damage to growth sites is to be eliminated, any bone fracturing, or stripping of periosteum in order to obtain approximation is to be avoided.

It has been found that surgery can and does inhibit normal growth. The damage depends on trauma and lack of blood supply. Undamaged congenitally deformed parts will grow at normal rates. This all indicates that poorly timed or poorly executed surgery is detrimental to normal growth.

Donald R. Kennedy

CRITERIA FOR EXTRACTION IN ORTHODONTIC THERAPY RELATED TO DENTO-FACIAL DEVELOPMENT

J. A. Salzmann. American Journal of Orthodontics, 35:584. August, 1949.

The author reviews much of the literature concerning inherent growth and functional adaptation of the jaws and explains how several approaches to the orthodontic problem all confirm the conclusion that extraction of teeth must be a part of the treatment in some cases in order to avoid placing the teeth in a "state of shear" relative to the closed functional system of the jaws. Proper emphasis is placed on the limitations of extraction of teeth as an aid in orthodontic treatment.

The author presents Bjork's method of analyzing facial structures in order to appraise both angular and linear relationships. He concludes that the correction of alveolodental prognathism and procumbency of the incisors is made possible or is assisted by the extraction of certain teeth, usually first bicuspids. Facial prognathism which involves the maxillary corpus and mandibular corpus is not improved by orthodontic treatment. The author believes that it is hazardous to establish a diagnosis of procumbency of incisor teeth and alveolodental prognathism and to extract teeth on the basis of the diagnosis until all facial growth is virtually completed.

Cases are presented to demonstrate how variation of the relationship of the dental arch to its basal arch and variation in the size and form of the lips, nose and other soft tissues of the face complicate diagnosis and may mislead the diagnostician. No single factor, not even procumbency of the mandibular incisor teeth, should be accepted as a sole criterion for extraction.

The author summarizes his extensive presentation by listing the following criteria that must be considered in determining whether or not to extract dental units: (1) the labiadlinguad dental arch relationship to the prementon point; (2) the size of the gonion angle; (3) the axial inclination and the relationship of the mandibular incisors to a plane which passes through the prementon point and is perpendicular to the mandibular plane; (4) the type and degree of irregularity and crowding present in the dental arches before orthodontic

treatment is undertaken; (5) the presence of constriction of the basal arches in relation to the dental arches; (6) the relative difference in size of the basal arches, and (7) the amount and distribution of the soft tissues covering the facial bones.

T. D. Speidel

FLUORINE—ITS RELATION TO DENTAL CARIES

L. R. A. Williams. Australian Journal of Dentistry, 53:253. September, 1949.

This article is a review of the literature concerned with the fluorine ion and the carious lesion. It does not contain original research.

It states that four applications of a 2 per cent sodium fluoride solution preceded by a prophylaxis is required to obtain a maximum reduction of 40 per cent in the incidence of dental caries in children. Whether artificial fluoridization of water supplies will produce the same reduction in caries as naturally occurring water is not known.

Dietary reduction of refined carbohydrates is still of primary importance in controlling caries activity, but the use of fluorine and its compounds shows promise as an aid in lowering the incidence of carious lesions. It must be remembered that fluorine is not a panacea.

R. L. Richardson

THE PULPLESS TOOTH AND APICECTOMY

W. Stewart Ross, F.D.S., R.C.S. (England). The Dental Gazette. Volume XVI. September, 1949.

The anatomy of the apical third of the root with its numerous accessory root canals presents a permeable area in which bacteria can lodge, and through which their poisonous waste products can diffuse into the surrounding tissue. Since it is impossible to clean out these sometimes lengthy and tortuous canals it is at once obvious that a sure method of eliminating this infected midus is to resect the apical third of the root. This operation is usually confined to anterior teeth where the roots are easily accessible.

The following treatment is advocated for all infected pulpless teeth, and when such cases are followed by resection of the apical third of the root, a satisfactory result should be obtained in every case.

Instrumentation of the pulp canal should be carried out through a pool of antiseptic such as triformol. After access is gained to the canal a hot point, consisting of an electrically heated smooth wire capable of being raised to a high temperature, is placed in the canal to the apex and retained for six or seven seconds to volatilize the antiseptic solution.

A similar result can be obtained by using a diathermy machine having for one of its poles a thin wire reamer while the opposite pole consists of a metal plate with a saline pad bound around the patient's wrist. When the point of the reamer touches the tooth or pulp tissue, a current is set up which is capable of desiccating the contents of the root canal.

The canal is filled with triformol and enlarged with a reamer to the desired size. The hot point is again applied to the canal. The canal is then dried and filled with copper cement and a gutta-percha point.

In the case of anterior teeth the next step should be to resect the apical third of the root. The incision, made high up toward the labial sulcus, should be semicircular, and approximately ¾ inch long with the convexity of the incision toward the apex of the tooth. A window is cut in the bone in the region of the apex with a fissure burr; the apical third of the root is removed and the cavity syringed with a weak antiseptic solution. The cavity may be closed with a suture, but usually this is not necessary as the lip closes the wound when it is in its natural position, and healing is by first intention.

The use of concentrated penicillin solution in the cavity is contraindicated, but an intramuscular injection of 500,000 units immediately before and again six hours after the operation will help considerably toward the destruction of bacteria that may have been left in the periapical tissues after the operation.

Chas. F. Sumner, III

THE BIOCHEMISTRY AND METABOLISM OF DENTIN AND ENAMEL

H. Eggers Lura. New York State Dental Journal. 15:8. Pages 457-465. October, 1949.

The paper begins with a brief review of work on biochemical factors in dentinogenesis and amelogenesis. Lura suggests that the ossification process in bone, dentin and enamel may begin by the action of catheptic enzymes forming a protein matrix, aided by the activating effects of vitamin C and other reducing substances, and followed by a period of phosphatase activity during which organic phosphate esters are hydrolyzed so as to produce phosphate and calcium ions in sufficient quantity to exceed the solubility of calcium phosphate.

Evidence is cited to support the view that there is a metabolism of dentin and enamel and it is proposed that caries are due to a reversal of the enzymatic processes involved in amelogenesis. The evidence of this particular point is weak, but perhaps light has been shed on a new factor in cariogenesis.

The author brings his paper to a conclusion with a strong sponsorship of the view that the dental tissues have a definite, though low grade metabolism which is influenced by systemic changes and all the other things which influence the metabolism of any tissue. There are 44 references.

Thomas R. Blohm

BENIGN HYPERPLASIA OF THE MANDIBULAR CONDYLE

Robert H. Ivy. Plastic and Reconstructive Surgery, 4:445. September, 1949.

The author presents a case of bony and cartilaginous enlargement of the condyloid process of the mandible, resulting in slow progressive vertical elongation of one side of the face and the formation of a crossbite occlusion. Practically no interference with the motion of the mandible was found. As these cases progress there may be some pain on motion in the region of one or both condyles. The case described is that of a woman, age 38, who presented the typical syndrome due to hyperplasia of the left mandibular condyle occurring over a period of several years. The left side of the face was elongated with the chin deviated to the right, and a hard prominence could be felt over the left condylar region. The movements of the lower jaw were unrestricted, but there was slight pain in both joints. Roentgenographic examination showed marked enlargement and irregularity of the left mandibular condyle.

It was decided to resect the enlarged left condyle and this operation was performed under endotracheal anesthesia. A skin incision two inches long was made beneath and behind the left angle of the mandible and part of the masseter muscle reflected from the outer surface of the ascending ramus, as suggested by Risdon. A Gigli saw was carried around the neck of the condyle by the use of a Blair curved pedicle needle, and made to emerge through the sigmoid notch just beneath the zygomatic arch, where it was exposed by a small stab incision. The neck of the condyle was quickly divided by the saw, dissected free of the soft tissues and removed intact. The specimen revealed a greatly enlarged condyle with cartilaginous and bony proliferation. The wound was closed with deep catgut sutures and silk for the skin, without drainage. Healing was uneventful with immediate restoration of the symmetry of the face and occlusion of the teeth. The author suggests this method of approach because of easy and rapid access, less danger of seventh nerve complications, time saved by use of the Gigli saw and less mutilation of the pathologic specimen.

Heyl G. Tebo

SOME ASPECTS OF THE DENTAL RESEARCH PROBLEM

H. Trendley Dean. The Gorgas Award Essay for 1949. The Military Surgeon, 106:27. January, 1950.

Within the framework of dentistry lie a great number and a bewildering diversity of research problems. One of the most pressing problems is where to find the manpower qualified to carry on the research that is so important to continued progress in the campaign against dental disease. The methods of dental research are no different from those of medical research. The widespread prevalence of dental caries and periodontal disease under varying sets of conditions and circumstances calls for epidemiologic investigations on a large scale. Similar methods have been used in connection with the fluoride dental caries relationship and may well bring significant answers to some of our problems in these other important fields.

Basic research is essential at all stages of the problem and must not be overlooked. The total number of dollars spent for dental research has been very meager, but there are now opportunities to enlist the support of the government through the National Institute of Dental Research which has set up the machinery for approving special grants-in-aid where suitable projects are presented by competent research workers. These applications for research grants are reviewed by a committee of outstanding experts from both governmental and private sources and the competent research worker with a significant problem can count on sympathetic consideration for his application. Some fellowships are also currently provided under National Institute's Health Research Grants and Fellowship program, which should give additional aid to the promising students and thus increase the pool of research workers.

Charles W. Freeman

Book Reviews

DENTAL PRACTICE MANAGEMENT

By S. L. Drummond-Jackson. Second Edition. 370 pages, with 85 illustrations. Index. Price 30 shillings net. London, England: Staples Press, 1949.

Drummond-Jackson's revised edition offers the profession a competent and very complete study of the subject. The book will probably not cause much of a stir among American dentists, however, partly because of an essentially British approach to the problem, and partly because several American texts deal with many phases either better or at least more to our own taste.

For example, in the discussion of the "tray" or "setting" technic, pages are wasted listing in detail the precise instruments to be placed on each tray for every type of dental operation. No two American dentists operate the same, and while a page of discussion on the principle of the tray method of operation is very much in order, excessive details clutter up the book. Likewise, the sections on records and bookkeeping seem cumbersome and lacking in incisiveness.

The first four chapters, however, which deal with assistantships, partnerships, and practice purchases, make the book an important addition to a dental library. Here the author's insistence on detail stands him in good stead, and the young graduate will find no better analysis in all the literature of these too-frequently neglected business problems that confront him upon graduation.

Altogether, this somewhat encyclopedic study of office management is an important contribution in the field and can be read with benefit by all students of dental economics.

W. N. Kirby

ATLAS OF ORAL AND FACIAL LESIONS

By Ralph Howard Brodsky, D.M.D. First edition. 127 illustrations with 100 Kodachrome slides. Index. Price $80.00 (includes Color, Film Library). Baltimore: Williams & Wilkins Co., 1949.

Dr. Brodsky presents, to the dental and medical professions, his new illustrated text, with a rather extensive collection of 100 Kodachrome 2″ x 2″ slides mounted in glass. The slides are well chosen and cover the selected field with good judgment.

The sequence of the slides are in excellent order, beginning with "The Malignant Tumors," the pathology of prime importance to the dentist, following with the benign tumors, a series on oral manifestations of systemic diseases and concluding with the blood dyscrasias and the tuberculous lesions.

Credit is given to Dr. Gustav Bucky for the development of the camera which was instrumental in taking these exceptionally fine Kodachromes, as it is extremely difficult to obtain good pictures within the confines of the oral cavity.

A small descriptive index accompanies the slides. The index includes a brief description of each slide with a diagram outlining the important features of each case. A brief note on therapy is given, and roentgenograms are included where necessary. Dr. Brodsky is a master at using brief, precise and thorough descriptions.

It appears this atlas would be an excellent way for a school, study club or young teacher to obtain a film collection, building a library around this nucleus.

It is regrettable that the cost of the text will keep it from its rightful place in the library of the dental student or general practitioner.

William B. Martin

NEW TEETH FOR OLD

By Victor H. Sears, D.D.S., 80 pages. Index. Salt Lake City: University of Utah Press, 1949.

"In the average person the hardest time of all is the worry-time just before the teeth come out. Sometimes a patient will worry herself sick imagining all sorts of unpleasant things. When the time comes to consider artificial dentures the intelligent person has many questions. You will find some of the answers on these pages." This quotation from the introduction summarizes the author's purpose in writing the book.

The first four chapters give the reader a brief review of preventive dental measures. Believing that fear of disease motivates a person to protect his teeth, Dr. Sears offers case histories of Peter Kyne and Theodore Roosevelt. One wonders if the author is justified in stating that rheumatism is caused by focal infection.

Expert that he is in full denture prosthesis, Dr. Sears is at his best when discussing immediate dentures, how artificial dentures are made, art in artificial dentures, fit, occlusion and servicing of dentures.

The final chapter, "How to Enjoy Your Artificial Dentures" would be fruitful reading for anyone being initiated to new teeth.

New Teeth for Old would be in order for reception rooms of dentists serving adults. Also parents bringing children to dentists would do well to read it, furnishing proof as it does, of the value of early and regular dental care. Yes, even the dentist himself might enjoy reading it at odd moments because it offers hints of what should be told to denture patients.

J. M. Wisan

PERIODONTIA

By Henry M. Goldman, D.M.D. Second Edition. 611 pages with 488 illustrations, 18 in color. Index. Price $12.50. St. Louis: C. V. Mosby Company, 1949.

This single volume on periodontia attempts to describe and correlate fundamental principles of practice so that the student and general practitioner can easily grasp them. A great deal of information has been assembled, much of it sound and useful; portions of it, however, are controversial and misleading.

Statements such as "The presence of a small number of round cells in the subepithelial tissues (gingival corium) however, cannot be considered as an indication of gingival inflammation (gingivitis)" are unfortunate. Quite obviously no such choice exists. It is a commonplace in pathology that a patch of round celled infiltration is the response of the tissues to chronic irritation, hence inflammation.

Such statements as "Since almost every human gingival crevice contains this subepithelial infiltration, it seems that a gingival crevice with a complete, well hornified lining should be termed normal; and if the lining shows distinct breaks and defects and there is a marked round celled infiltration in the subepithelial tissue should be called a gingivitis" are based purely on laboratory findings which are obviously obtained too late for treatment of such cases. None of the factors listed above can be observed clinically. They can only be surmised. A classification based upon clinically observable conditions would be more useful.

Other controversial information is presented as though it were factual, by quoting authors who supposedly have demonstrated the implied fact. Quoting J. Weinman, the author states that "chronic inflammation of the gingivae progresses, following the course of the blood vessels, into the marrow spaces on the periosteal side of the alveolar bone; only in exceptional instances does it penetrate the periodontal membrane." We agree with the statement for labial, buccal and lingual surfaces. However, the penetration of the periodontal membrane is quite the rule for mesial and distal surfaces because the blood vessels follow this course also.

Unfortunately the addition of the term "intra boney pocket" is more confusing than helpful. Such a condition probably does not exist except in cases of acute infection followed by necrosis. All periodontal pockets consist of two surfaces: a soft tissue side and a hard tissue side, the tooth. Roentgenographic evidence seems to imply that the pocket is located between the tooth and the bone. The author states that in this type of pocket the base is apical to the alveolar crest, there being bone in the lateral wall. This, of course, leads to faulty interpretation. The bony lateral wall is related to the adjoining tooth and not the tooth with the pocket.

The supposition that gutta percha points placed in a periodontal pocket before a roentgenogram is made provides an accurate method for determining the exact depth of the pocket is quite misleading. The base of the pocket in these cases, lacking epithelial continuity, with loose granulations between it and bone could easily be penetrated by a gutta percha point; hence its position may not locate the base of the pocket. The whole philosophy of treatment based on such a misleading premise leads to false hopes as regards the question of reattachment even in these cases. The author suggests that the loose granulation tissue, below the epithelial base of the pocket and the bone, be removed to provide reattachment thereof. Since the first healing would be expressed in the form of granulation tissue, why remove it?

Space requirements will not permit a discussion on the author's controversial analysis of such a subject as the depth of the crevice with its toxic contents and adjoining bone resorption as well as the question related to condition called periodontosis.

Most of the illustrations are good; some indistinct and conclusions drawn therefrom are debatable. The conclusions drawn for the cases between pages 135 to 152 seem doubtful. Too much destruction of tissue has occurred to permit a clear cut evaluation.

Each chapter is followed by a well selected bibliography. The index is more than adequate. Students, teachers and practitioners could read this book to their edification and benefit.

G. R. Lundquist

ORAL PATHOLOGY

By Th. Mavrogordatos, D.D.S. 692 pages with 259 illustrations. Index (Greek & English). Price $13.00. Athens: Speropoulos, 1949.

The author presents in this book the various diseases which affect the soft tissues of the oral cavity and its adjacent parts. Listing first the mild forms of lesions which have their origin in local factors, the author carries us through to the systemic factors which present oral manifestations, includes a substantial section on tumors of the mouth and finally closes with a chapter on the present status of chemotherapy and the use of the antibiotics in dentistry.

The book is well written and covers a wide range of material and, therefore, would serve very adequately as a source of reference. To give a brief indication of the range of material covered one may cite the oral manifestations due to avitaminosis, endocrine disturbances, anemia (pernicious, aplastic, leukemia), systemic diseases giving signs in the mouth such as scarlet fever, syphilis, typhoid, measles, chickenpox, influenza, and so forth, mycoses, heavy metal poisoning, cysts, neoplasms of the gums, lips, palate and floor of the mouth and congenital deformities.

The illustrations are inadequate in several respects; they show lack of clarity and definition, are limited in their scope to portray the areas of pathology and certainly are too few in number for a volume of this size which covers such a wealth of material.

The author attempts to give the diagnosis, treatment and prognosis of each topic discussed and because of the completeness with which this is accomplished and for presenting the most recent methods of treatment according to present day knowledge he must be given credit for a task well done.

Perry Alexander

REHABILITATION OF THE HANDICAPPED. A SURVEY OF MEANS AND METHODS

Edited by William H. Soden. Foreword by Sidney Licht, M.D. 309 pages, with index of names and index of subjects. Price $5.00. New York: The Ronald Press Company, 1949.

This volume assembles representative accounts of procedures in current use for the mental and physical rehabilitation of persons disabled by illness or injury or otherwise handicapped, with 38 specialists in various fields of the rehabilitation process contributing reports on their recent activities in a common effort to increase the general understanding of the subject.

The table of contents is divided into five parts: Part I, General Medical and Surgical Techniques; Part II, Neurological Methods; Part III, Psychiatric Developments; Part IV, Vocational and Social Rehabilitation, and Part V, Educational and Psychological Trends.

The subject matter is not of too direct professional interest to dentists as the rehabilitation of handicapped persons calls for the application of the skills of many individuals and groups both within and without the health service professions. However, dental service is often a necessity in the program of the rehabilitation of the individual and in order to take a proper place in the team of rehabilitation personnel, the dentist should acquaint himself with present practices in the whole field of rehabilitation.

Further, the dentist, as a well educated citizen in his community, should take part in the expansion of community interests in the problems of the handicapped. One author in the book estimates that there are 25 million sufferers from chronic ailments, many disabling, with 50 per cent of the sufferers under 45 years of age; that one million deaths occur yearly from chronic diseases and over 10 million days of disability each year result from chronic diseases. Not all of this wastage can be eliminated through rehabilitation, but the problem is being actively studied and remedies sought from the national down through the state and community levels.

The volume is recommended reading for alert and progressive dentists.

William McGill Burns

NUTRITIONAL DATA

Compiled by Harold A. Wooster, Jr., and Fred C. Blanck. 111 pages with 3 additional pages of selected bibliography. Published and distributed gratis. Pittsburgh: H. J. Heinz Company, 1949.

It was in 1934 that the H. J. Heinz Company first published their interesting brochure of tables and descriptive information relating to the nutritive value of foods under the title of "Nutritional Charts." This publication was well received as evidenced by the 12th edition being published in January, 1946. The recently published brochure entitled *Nutritional Data* is the successor to the earlier Nutritional Charts and is prepared, as were earlier editions, for medical, dental and dietetic specialists.

Nutritional Data has an entirely new format which makes the volume more convenient to use. The material on vitamins, essential ele-

ments, intermediary metabolism and many other topics has been brought up to date. With the rapid advances in biochemistry and nutrition and allied fields during the past few years the compilers have rendered a real service by bringing so much scattered information into so readable a form.

As in earlier editions, considerable space is devoted to vitamins and minerals, their dietary sources, their functions and deficiency signs and symptoms, and to tables of composition and nutritive value of foods. Two of the important additions are: (1) a list of the essential amino acids and their special functions, and (2) a table entitled "Essential Amino Acid Composition of Protein Foods."

Since this brochure will be sent gratis to any professional person who requests it, in the opinion of the reviewer, it will be time well spent to write to the H. J. Heinz Company for a copy.

Nina Simmonds

A TEXTBOOK OF SURGERY FOR DENTAL STUDENTS

By G. Percival Mills and Humphrey Humphreys. Fifth edition, Index. 368 pages with illustrations. Baltimore: The Williams and Wilkins Company, 1948.

The fact that this book is now published in its fifth edition and has been reprinted four times indicates that it is a popular English text. In the preface the author states that, "It will be found to cover the requirements of the Royal College, and of those universities which publish a detailed syllabus." Their description of the book as "a work designed solely for students and practitioners of dental surgery" might be prejudicial to some readers, this dependent on their viewpoint.

The first nine chapters, approximately half of the book, deal mainly with fundamental concepts of tissue reaction to injury, and a discussion of the various processes which take place during repair. The treatment of this subject is in the main well done. The information is concise and should serve as a satisfactory basis for further study. However, there is in this section of the book material which might be questioned. On page 68, in the discussion of hemophilia these statements occur. "As a rule, the males only are affected." "In treating such a case the styptics described under capillary hemorrhage should be tried, viper venom and thrombin being the most hopeful; should these fail, steady and prolonged pressure will be required, and this can best be done by suture, or by packing the cavity and binding the jaws together. Vitamin K may be given by injection, and blood transfusion should not be long delayed."

The remaining portion of the book is given over to the description of and the treatment for many types of pathology. Most of these are directly or indirectly connected with the problems of oral surgery. The book has a number of illustrations, some of them in color. For a book of but 361 pages, it contains information upon an unusually large number of subjects. Perhaps its greatest use would be that of a guide to collateral reading.

Warren R. Schram

MONEY MANAGEMENT —THE HEALTH DOLLAR

Edited by Leone Ann Heuer, Director, and associates, Consumer Education Department of the Household Finance Corporation and Subsidiaries; Headquarters, Chicago. Price 5 cents. 32 pages. Copyright 1945, Revised Edition September, 1949.

This excellent booklet reflects in an ethical manner the incentives of a great corporation to assist individuals and families to achieve financial security through skillful handling of money, especially as related to procurement of health services.

Because of the fact that millions of families come to the Household Finance Corporation each year for help on money problems and because they lend money to these families, naturally, as their president, B. E. Henderson states, "the corporation is interested in their efficiency as going concerns."

Under Chapter 1, "How to Keep Medical Bills Down," the authors stress the fact that "there are ways to maintain good health and to keep medical bills at a minimum by preventing illness and accidents—by knowing what medical and health services are available and using them when they are needed." They state, "Buying poor medical advice is costly at any price."

A lucid dissertation concerning the importance of taking care of oneself: learning what to do, avoiding self-diagnosis, reading labels on drugs, keeping medical supplies simple and using Public Health Services is found under subtitles.

Chapters describe in a splendid manner how to choose the physician, dentist, nurse, hospital and clinics for medical care; care in chronic illnesses, prepaid programs for health care and medical care for veterans.

Naturally we are interested in the chapter titled "How to Choose Your Dentist." Factors concerned with the choice of a competent

dentist are portrayed in an interesting and reliable way and the subtitle "How to judge a dentist's qualifications" is excellent.

The chapter ends with a paragraph revealing the vast importance of "Being Frank With Your Dentist." The authors state, "Your frankness regarding your financial position and your dental history helps your dentist to help you."

All in all the booklet deserves commendation for its intelligent approach to a timely subject. Those who read and heed will discover that health services can be procured with excellence, economy and integrity.

Lloyd H. Dodd

ROENTGEN DIAGNOSIS OF DISEASES OF THE SKULL. VOLUME NINETEEN, ANNALS OF ROENTGENOLOGY, A SERIES OF MONOGRAPHIC ATLASES

By Max Ritvo, M.D. First Edition. 389 pages with 368 illustrations. Index. Price $16.00. New York: Paul B. Hoeber, Inc., 1949.

The author presents a carefully assembled collection of roentgenograms of various anomalies and pathologic processes of the skull from the files of a large teaching clinic, the Boston City Hospital. Rare conditions as well as those more commonly encountered are included; in addition there is a detailed section of the normal appearance of the skull and the many variations of normal. Without such information, of course, any deviations from normal would be meaningless. The discussion of normal skulls includes roentgenograms of patients of many ages, from eleven days after birth to the adult.

Congenital, hereditary, and developmental anomalies are covered; other sections deal with traumatic and postoperative changes; infections; nutritional, endocrine, and metabolic disturbances; the fetal skull in pregnancy; intracranial calcifications; neoplasms and cerebral angiography.

Instead of describing only the roentgen appearance of each pathologic process, the author has included a concise discussion of its etiology, clinical findings, type of treatment, prognosis, and so forth, with each, and thereby very clearly conveys to the reader just how and why certain roentgenographic appearances fit into the overall picture.

Although the teeth and jaws *per se* are not included in this volume, many disease conditions and neoplasms which may produce changes in these structures as well as the skull are analyzed. It is recommended as a reference book for the oral diagnostician.

LeRoy M. Ennis

SUBJECT: HEALTH, A HANDBOOK FOR HEALTH EDUCATION

Produced by the Queensland Health Education Council. 384 pages, profusely illustrated. No price given. Published by the Queensland Health Education Council, Brisbane, Australia.

A handbook on health for teachers, this is one of the finest works of its kind this reviewer has seen. There is nothing comparable to it in this country.

The book is arranged by subject and grade. Subjects covered are: communicable diseases, food for fitness, anatomy and physiology, posture, teeth, safety first, pests and miscellaneous topics. Each subject is assigned a chapter. Each chapter is then divided into grade levels. Appropriate suggestions to the teacher are given for each grade. First authoritative resource material is given, then suitable stories, songs, illustrations, activity suggestions, and teaching guides are given by progressive grades. All material is authoritative and approved by the proper professional organizations. The chapter on teeth, for instance, was approved by the Australian Dental Association (Queensland Branch).

This book was difficult to review because it was such fascinating reading that a critical attitude was difficult to maintain. It is the sort of publication that is conspicuous by its absence in our educational material and yet is so badly needed.

The grade levels and certain words that are native to Australia may have to be modified to make it applicable to the United States. It has one annoying defect: the pages are not numbered and therefore it is quite difficult to quickly locate a specific chapter or subject.

H. Shirley Dwyer

ATLAS OF ROENTGENOGRAPHIC POSITIONS

By Vinita Merrill. Two volumes, 663 pages, illustrated. Price $30.00. St. Louis: The C. V. Mosby Company, 1949.

The author has provided a practical reference book for X-ray technicians in this comprehensive two-volume edition. Not only are the standard positions accurately described and illustrated but many specialized positions not used routinely and not ordinarily included in general textbooks are presented. The material adheres strictly to the positions employed in roentgenographic work; except for a general discussion of fundamentals contained in the first section under the heading, "Preliminary Steps in Roentgenography," such specific ex-

posure factors as milliamperage, kilovoltage, focal-film distance, and so forth are left to other texts.

Pertinent facts on general anatomy, the skeleton, body planes, projections and depressions are included, as well as a glossary of anatomical and medical terms.

The text is divided into sections dealing with the anatomy and positioning of the various parts of the body. These are clearly described and well illustrated, great care having been taken to facilitate the technician's understanding. A number of the illustrations were adapted from the illustrations published by the authors of certain positions, credit being given in the respective legends. The degree of thoroughness attained in the work is exemplified by a statement made in the first paragraph: "There is no examination in roentgenology where accuracy and attention to detail are not essential, be it of a finger or of a brain." Indeed, under "Anatomy and Positioning of the Upper Extremity," 14 pages and 47 illustrations are devoted to the hand alone.

The twenty-five pages entitled "The Mouth (Teeth and Salivary Glands)" are done more thoroughly than the usual text dealing chiefly with medical roentgenology. Anatomy of the oral cavity and its related structures, dental films, equipment, handling and mounting of films, exposure techniques, and rules for angulation are adequately presented, as well as a detailed description of the several film placements in both the erect and supine positions. Each of the descriptions is supplemented with photographs, diagrams, and reproductions of the resulting films.

The professed aim of this work, namely: the assembly of material, has been ably accomplished through clear and careful descriptions, well-made illustrations, and an extensive bibliography, resulting in an excellent reference book for roentgenologists.

LeRoy M. Ennis

SUPPLEMENT TO CHILD HEALTH SERVICES AND PEDIATRIC EDUCATION. REPORT OF THE AMERICAN ACADEMY OF PEDIATRICS

Price $3.50. New York: The Commonwealth Fund, 1949.

The report of *Child Health Services and Pediatric Education* described the origins, objectives, and highlights of the study conducted by the American Academy of Pediatrics. The present volume is a supplement to this publication, presenting the underlying methodology and detailed tabulations on hospitals, community health agencies, and physicians and dentists in private practice, from which the condensed data of the report were drawn.

In order to facilitate an intensive analysis of the survey findings, the staff has included a glossary of terms used in the study, a reproduction of schedule forms, and a discussion of procedure and method. In determining the number and distribution of dentists in private practice, the staff was unable to correct fully for the bias occasioned by the large number of practitioners still in military service between April and December, 1946. Data on the number of visits reported by dentists have been adjusted to complete coverage to represent all dentists on an average day of the year. Unlike comparable surveys purporting to measure the patient load of practitioners, the pediatric study attempted correction for seasonal variation. However, it appears open to question whether such a statistical refinement is justified by the nature of the data collected.

This Supplement is unhesitatingly recommended to all health workers interested in the planning and conduct of surveys. It is a description of careful and intelligent research methods, which all too infrequently characterize investigations of health care.

Samuel Herman

KRONFELD'S HISTOPATHOLOGY OF THE TEETH AND THEIR SURROUNDING STRUCTURES

By Paul E. Boyle, D.M.D. Third Edition. 514 pages with 464 illustrations. Index. Price $8.00. Philadelphia: Lea & Febiger, 1949.

This book is a combination of oral histology and oral pathology, something which is a desirable sequence for the undergraduate student, the graduate student, or the practicing dentist. As presented, the normal histological descriptions serve as an introduction in each division of the book. The descriptions are concise and clear, and include all the salient features as well as the controversial problems. The pathological descriptions follow the normal descriptions and their well worded form, complete in all respects, makes for a detailed discussion that may be readily visualized.

Dr. Boyle has altered very little from the book in its original form, but his additions from the field of research, as well as minor elaborations in several subjects, has brought the present book to an up-to-the-minute edition. Some deletions have been made because of new findings, which in some instances has altered former material and has suggested new treatments. The changes which have been made in nomenclature deserves creditable

mention. This is particularly evident in the chapter on the pathology of the investing tissues where a change in terminology makes for an improvement over the former edition. Not only is change of nomenclature noted in subject content but it appears in chapter headings and their subtitles. The book is well illustrated with photomicrographs.

While many of the original illustrations remain, many new ones have been added. Each illustration carries a complete legend. The bibliography is extensive and should serve as a useful adjunct to the graduate student or to the research worker. A suggestion might be offered that this book should be a "must" for every dentist's library.

J. R. Schumaker

DIAGNOSE UND THERAPIE DES INFIZIERTEN WURZELKANALES (DIAGNOSIS AND TREATMENT OF THE INFECTED ROOT CANAL)

By Florian Prader, D.M.D. 225 Pages with 153 Illustrations, 8 Tables, 48 Microphotographs. Index. Price: Not Given (Price in Swiss francs 26). Basel, Switzerland: Benno Schwabe & Company, 1949. Imported by Grune & Stratton, Inc., New York City.

This book represents an outstanding contribution to scientific dental literature, and is the result of years of research by the author as well as by his associates at the Dental School, University of Basel.

Dr. Prader introduces new methods in pulp diagnosis and therapy. He differentiates between an inflammation of the pulp due to penetration of toxins (without infection) and inflammation due to bacterial invasion. The former might be stopped and cured without pulp exposure. The latter might not be. Bacteria penetrate dentinal tubules ahead of the decalcification process in caries. These are gram negative microorganisms. If a pulpitis develops under a silicate filling long after such a filling was placed in a tooth, the author always finds infection of the pulp, and therefore does not believe that unneutralized acid is the damaging factor in these cases. This infection starts with the invasion by the gram negative bacteria in the dentinal tubules, found ahead of the caries process. If a pulpitis and pain developed shortly after the silicate filling was placed, the author claims the pulp must have been accidentally exposed. He confirms these statements by very ingenious bacteriologic tests of the exposed pulp. He also discusses the pulp inflammations which sometimes develop after amalgam fillings are placed in a tooth.

An important new method of diagnostic investigation is the bacterial test at the first exposure of the pulp. Gram negative bacteria (micrococci), he believes, are "advanced forces" in the carious process. Gram positive cocci originate from the proteolytic area of the carious process and segmented filaments and spirochetes, he assumes, indicate a secondary infection by salivary elements.

Another new diagnostic method is introduced in the examination of the first drop of blood which appears at the site of pulp exposure. Prader investigates qualitatively as well as quantitatively, the leukocytes and other blood elements and makes his diagnosis of the pulp disease according to his findings.

The discussion of asepsis is most enlightening. Prader advocates arsenic (Nervarsen) in a controlled dosage to devitalize a pulp. Much emphasis is laid upon the technic of hot rinses of the infected root canal with antiseptic drugs.

Excellent illustrations accompany the text. The charts which follow each chapter give a very excellent summary of the statements made.

The reviewer can only repeat that this is a most excellent scientific contribution to dentistry and is most highly recommended. If this book were translated into English, it would be a great stimulus to research in this country.

Balint Orban

CHILD DEVELOPMENT. PHYSICAL AND PSYCHOLOGICAL GROWTH THROUGH THE SCHOOL YEARS

By Marion E. Breckenridge, M.S., and E. Lee Vincent, Ph.D. Second edition, illustrated, 662 pages. Price $4.00. Philadelphia: W. B. Saunders Company, 1949.

This book, designed for professional students in psychology, teacher training, home economics, nursing and social work as well as for parents, has been revised and brought up to date to include the most modern knowledge and concepts of physical and psychological growth from birth to young adulthood. The authors have followed the plan of discussing first some general principles of development, then devoting a section each to physical growth and emotional growth; the various influences on growth such as nutrition, home, school, church, camps and other community factors; growth and the use of the body; growth of sense perceptions and judgments; development of memory, imagination, creative ability; language, thinking and reasoning;

social and personality development; conflict and aggression; cooperation and friendship; moral judgment and psychosexual development; and finally summarizing the growth achievements.

Throughout the text the concept is emphasized that all aspects of growth are interrelated, and this doctrine is given further stress by case studies which demonstrate the integration of all these aspects and the effect on the whole person of environmental factors, disease, nutrition, and so forth.

To any worker in the health field who deals with children and adolescents, and who is wholeheartedly in accord with the concept that he is working with a whole child rather than merely with an oral cavity that needs attention, this book should prove invaluable. The authors are aware that even a single visit to the dentist's office may have a lasting effect upon a child's attitudes and feelings—favorable if the dentist understands the child and approaches him properly, unfavorable if the reverse is true. Dentists are likely to meet children at what, to the children, are important crises in their lives, so that whatever they do with them carries the permanency of vividness and dramatic excitement. The authors believe that these professional workers profit from an understanding of child development.

Dentists who are parents also will find this book useful, tracing, as it does, both the "growth" and the "growing up" of the child.

Paddy Howes

WOMEN IN MARITAL CONFLICT: A CASEWORK STUDY

By Florence Hollis, Ph.D. 236 pages. Schedules, Bibliography, Case and Subject Indexes. Price $3.50. New York City: Family Service Association of America, 1949.

While of particular value to caseworkers, this study will be of great interest to all those concerned with problems of marital adjustment.

Acknowledging the debt that modern casework owes to Freud, Dr. Hollis writes, "The principles of personality development and the dynamics of personality functioning which have been developed by psychoanalysis provide the framework upon which rests most modern casework treatment of psychological problems."

Within this framework, in an analysis of 100 family case histories of women served by 11 member agencies of The Family Service Association of America in cities in the East, South, Middle West and Central States, Dr. Hollis seeks "to throw light on the dynamics of marital disharmony."

In the first section of the book she discusses causative factors of marital conflict and their significance in treatment. The internal factors of emotional dependence, masochism and rejection of femininity are discussed. Dr. Hollis next deals with the environmental factors involving interfering relatives, cultural differences and economic factors. She finds emotional dependence to be one of the chief causative factors of marital discord and further that the case records studied indicate that environmental factors are secondary as a source of conflict and usually become important only when more basic tensions and difficulties exist.

In a penetrating evaluation of the sex factor in marriage, she writes, "Case studies tend to support the belief that sexual adjustment is closely intertwined with, and dependent on, the total personality adjustment."

The influence of early childhood experiences and family relationships on the development of personality and expectations and needs in marriage are clearly brought out. And the reader is made aware of the need to interpret current behavior in terms of past experiences.

In Chapter XI, Dr. Hollis presents her own classification of case work treatment. It is "based principally on the means by which change was brought about, the various processes and combinations of techniques used, rather than primarily on the ultimate treatment objectives of these methods." Her division of the range of service into "environmental modification," "clarification," "psychological support" and "insight development" makes a real contribution to case work and marital counseling research methods. The critics of the author on treatment methods, which follow, will be of special value to all case workers.

While Dr. Hollis' study is preliminary rather than exhaustive and definitive, her findings provide important clues to the understanding of marital relationships and point out the need for further research along the same lines.

The methods used in this study are also a welcome contrast to the currently popular surveys whose sweeping and frequently inaccurate generalizations are based chiefly on an extensive use of questionnaires and other statistical material.

Freda S. Kehm

BUREAU OF LIBRARY AND INDEXING SERVICE

A study of terms; the concept "bifurcation"

The nomenclature project has now been under way for several months, and a preliminary report on various aspects of the undertaking will be forthcoming shortly. During the early stages, it has been thought desirable to formulate working plans, policy and principles, as well as to study some of the terms in certain areas of the subject. The report will consist of an account of earlier attempts to improve dental nomenclature, a statement of the aims and methods of the present project, an examination of the principles that determine the formation of words, the criteria that should guide criticism of proposed nomenclature, and a discussion of selected groups of dental terms, especially in the field of anatomy, with tentative recommendations.

The student who explores dental nomenclature must proceed cautiously with open mind, as should also the members of the profession who will review and evaluate the results. Among scholars there are some who think all attempts to improve terminology of any sort are undesirable and futile, believing that changes in language follow an inevitable course like the law of gravitation. There are also well-meaning reformers who think to legislate terms arbitrarily into authority and attempt to fix them for all time. The sensible outlook probably lies between these extremes. Whereas it would be impossible and pernicious for one man, or any group of persons, to control and direct the development of language, yet natural and beneficial influences may be evoked to encourage the use of the more accurate symbol, to introduce a needed new word occasionally, or to dislodge gradually old terms that have outgrown their usefulness although entrenched behind the forces of custom and habit. These influences include reason, a taste for harmony among symbols, the recognition that concepts themselves (the very things named) change with time, and the realization that, in many technical situations, intelligibility and the exact communication of ideas depend upon a strict uniformity of usage. Obviously, a term is not to be regarded as an old servant whose faithful service merits indulgence, but as a tool which must be sharpened when dulled by time and use, or discarded when expedient.

All findings in the nomenclature project are offered, for the time being at least as tentative suggestions to be reviewed in the light of the wisdom, logic, and needs of the profession. Comments, suggestions, and criticisms from readers are invited. These reactions will be viewed impartially and sympathetically; and, it is hoped, the profession will regard the tentative solutions of the report with equal freedom from bias.

In the study of individual terms, it has been thought advisable to explore groups of related concepts rather than to proceed alphabetically in dictionary

fashion through a miscellaneous list of words. In the preliminary report it is proposed to limit the study largely to anatomical and physiological terms; that is, to the normal phases of the mouth and jaws.

A concrete example of a group study of terms is presented below, such as might be made by any person interested in the nomenclature problem. It is a systematically arranged discussion of a group of related concepts commonly employed in the profession. It deals with concepts usually expressed in the profession by the words *bifurcate*, *bifurcation*, and *bifurcated*.

Terms discussed

Nouns: *bifurcation, trifurcation, furcation, furculation, furca, bifurca, interfurca, furcula*

Verbs: *bifurcate, trifurcate, furcate, furculate*

Adjectives: *bifurcated, bifurcate, trifurcated, trifurcate, furcated, furcate, furculated, furculate.*

Fundamental concepts

All terms pertain to division of the roots of teeth. The following analytical concepts should be provided for: (1) the state of being divided; (2) the area or region between the root branches at their base; (3) an undifferentiated number of divisions; (4) definite numbers of divisions; (5) normal anatomical division; (6) abnormal anatomical division. Terminology should discriminate between concepts (1) and (2); between concepts (3) and (4); between concepts (5) and (6).

Etymology

Latin *furca*, fork; *furcula*, little fork.

Synonyms in foreign languages

interradicularraum, interradicular space.

History

The words *bifurcate* (O.E.D., 1615) and *furcation* (O.E.D., 1646) have been in standard English since the seventeenth century. *Furca* and *furcula* (O.E.D., 1859) have been employed in anatomy during the nineteenth century.

Although in dental anatomy *bifurcation* is applied in the common sense to root canals and blood vessels, it has been extensively used in dentistry in a special sense; namely, the area or region between the root branches at their base.

The term was used by dentists at least as early as 1849, for Harris (*Dict.*, first ed.) defines the term as "division into two branches, as of a tooth into two roots." In Harris (*Dict.*, 4th ed.) 1878, the word is "sometimes applied to the angle made by the bifurcation." It is as this space between the roots that *bifurcation* is generally understood in dentistry, as for example, in such expressions as "exposure of the bifurcation," a condition usually calling for extraction of the tooth, and "perforation of the bifurcation." This meaning is identical with that of the German *Interradikulärraum*, interradicular space.

Criticism

In common with most active nouns ending in *-ation*, *bifurcation* has acquired, besides its sense of condition or process, the meaning of the product resulting; that is, the concrete space created by the division of the roots. Similar expansion of meaning is found in *operation*, *restoration*, and so forth. Although, ordinarily, no great confusion arises from the two senses of the word, a distinct structural word is available; namely, *bifurca*.

Obviously, the part in question is not necessarily between two roots, and it is, therefore, not logically a *bifurcation*. The term is, however, frequently misused in this sense. Wheeler (*Dent. Anat. and Physiol.*, first ed.), 1940, mentioned "a bifurcation dividing the root portion into two or more extensions of roots." This error was corrected in the second edition, 1950, by the insertion of the words "or trifurcation." A term noncommittal as to the number of forkings is desirable. The condition could be expressed by *furcation*, the location by *furca*, and the verb by *furcate*.

Diamond (*Dent. Anat.*), 1935, used the term *bifurcated roots* to designate abnormal anatomically divided root branches. Abnormal division of roots might be better termed by the verb *furculate;* the condition or process by *furculation;* and the divided part of the roots, by *furcula* or *rootlet*.

Furca is to be preferred to *interradicular space*, since the latter term is more descriptive of the whole space between the roots, from apex to base of the roots, normally occupied by alveolar bone. In this sense, the term *interradicular space* would harmonize very well

Developing multirooted tooth, viewed from apical aspect. A, bifurca; B, interfurca

with the term sometimes used, *interradicular surfaces* of the teeth, and probably should be reserved for that purpose.

Recommendations

furcation: normal anatomic division of the roots of teeth into separate branches, as in the posterior teeth.

furca (pl. *furcae*): the area or region lying between two or more normal anatomically divided roots at their base.

furculation: abnormal anatomic division of root branches into accessory rootlets.

furcula (pl. *furculae*): the portion of a root branch produced by abnormal anatomic division.

bifuraction: normal anatomic division of the roots of teeth into two parts.

bifurca: the area or region lying between two normal anatomic divisions of the roots of teeth at their base.

trifurcation: normal anatomic division of the roots of teeth into three parts.

interfurca (pl. *interfurcae*): the area or region lying between three or more normal anatomically divided roots of teeth at their base.

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Very little has been written on this concept.

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BUREAU OF ECONOMIC RESEARCH AND STATISTICS

Nineteen fifty survey of the dental profession. I. Introduction

The 1950 Survey of the Dental Profession was conceived as a result of an urgent need for information about dental practice. Numerous questions have been arising for which authoritative answers have not existed. The need for accurate, scientifically determined information is especially cogent in connection with (1) the planning of dental health programs for the community, state and nation, and (2) the refutation of misstatements regarding dental health and practice often made by proponents of compulsory health insurance. A good case can be made, too, for the general proposition that dentistry should "know itself" to assure sound solutions to the myriad of problems, many of which cannot be anticipated, which will arise in the future.

Early in April of 1950 questionnaires (shown elsewhere in this article) were sent to more than 20,000 dentists. From alphabetical lists of dentists for all states, including both members and nonmembers of the Association, every fourth dentist was chosen to receive the questionnaire.[1] To assure the dentist of anonymity, no signature was required. A business reply envelope was enclosed for the convenience of respondents. Also enclosed was a business reply card which enabled cooperating dentists to request a summary of important results in advance of publication.

Questions for the survey were formally solicited from the Central Office staff and from the Advisory Committee to the Bureau. Conferences with these groups were held to discuss the relative merits of the proposed questions. Many of the suggested items were omitted because they did not seem of sufficient importance and space was limited.

Part I of the questionnaire consisted of questions about the dentist, his practice and his training. Part II was a record of dental work performed during the week of April 16 through April 22. The questionnaire was sent in advance of this week so that the dentist would know what records to keep. The first page of Part II provided for a summary of the week, covering the number of patients, sittings, and hours spent in the office. The remaining three pages of Part II enabled the dentist to record the age and sex of each patient and work performed as it was completed. Space limitation precluded listing some types of dental work. In general, the more routine operations and treatments were listed.

More than 4,000 dentists returned questionnaires. This response, amounting to over 20 per cent of the original sample, was considered good in view of the length of the questionnaire and the time and effort required to complete it. Fourteen of the replies were from dentists now in other occupations and 123 from retired dentists. These will be analyzed separately. Some of the questionnaires were inadequately filled out and were excluded from the net sample. A few arrived after the cut-off date, June 5, and were thus eliminated. The net sample of active dentists numbered 3,726.[2]

In the absence of a 100 per cent response a question arises as to whether the

1. These lists did not include dentists in the armed forces except for a few recent inductees.

2. Percentages given in tables throughout the analysis are based on total number replying to the question being considered. No question was answered by all respondents.

CONFIDENTIAL

AMERICAN DENTAL ASSOCIATION

Bureau of Economic Research and Statistics

222 East Superior Street Chicago 11, Illinois

1950 SURVEY OF THE DENTAL PROFESSION, PART I

You will make the job easier and faster if you will read the questionnaire through to the end before starting to answer the questions.

Answers in the squares should be indicated thus: ☒

WHERE THE ANSWER TO A QUESTION IS ZERO, ENTER "0". For such questions, please do NOT enter a dash or leave the question unanswered.

A good estimate is better than leaving a space blank. However, if not even an estimate can be given, enter "NA" (not available).

Disregard code numbers in the right margin. They are merely to facilitate tabulation of answers. (1-5)

Present status (mark one)*: Working in the dental profession ☐; Retired ☐; Occupation other than (6)

dentistry (specify)_____ (7-8)

Office location: City_____ State_____ (9-10)

Year of birth _____ Sex: Male ☐; Female ☐. (11-12)

Race: White ☐; Negro ☐; Other (specify)_____ (13)

(Only those working in the dental profession need complete the remainder of this questionnaire. However, others will please return the questionnaire filled out to this point.) (14) (15-17)

Dental school graduated from (name and city)_____ (18-19)

Year of graduation _____ All degrees except honorary_____ (20)

Were you a member of the American Dental Association in 1949? Yes ☐; No ☐. (21)

Indicate percentage of your professional time you now spend in the following types of practice (should add to 100%): (22-23)

Individual	____%	Partnership	____%	Associated in group practice	____%
Intern	____%	Resident	____%	Employed by another dentist	____%
Army	____%	Teacher	____%	City health department	____%
Navy	____%	U.S.P.H.S.	____%	County health department	____%
Air Force	____%	Vet. Adm.	____%	State health department	____%

Other_____% (specify)_____

How do you classify your practice? General practitioner ☐; Specialist ☐. (24)

If you are a specialist, mark one specialty below:

Oral surgeon ☐	Pedodontist ☐	Prosthodontist ☐
Orthodontist ☐	Periodontist ☐	Oral pathologist ☐

Other (specify)_____

---

*If you are now temporarily inactive owing to illness or vacation, but intend to go back into dental work, mark "Working in the dental profession." (25) ☒

If you marked a specialty:

Are you a diplomate of your specialty board? Yes☐; No☐. (26)

Are you a member of your specialty society? Yes☐; No☐.

Are you licensed as a specialist in any state? Yes☐; No☐.

Estimate the percentage of your practice devoted to your specialty thus far in 1950_____% (27)

At what age did you establish yourself as a specialist?_____ (28-29)

After what formal training? _____ (30)

_____

Number of dental chairs used by you and your auxiliary personnel (excluding other dentists)_____ (31)

Do you have X-ray equipment in your office? Yes☐; No☐. (32)

Do you use a full-mouth X-ray in making your original diagnosis and treatment planning? Never☐; Occasionally☐; Frequently☐; Always☐. (33)

Do you sometimes arrange with the patient, before you begin his dental work, for payment of fees by the installment plan? Yes☐; No☐. (34)

Do you use the services of a credit-reporting agency? Yes☐; No☐. (35)

Do you use the services of a collection agency? Yes☐; No☐. (36)

What percent of your 1948 gross charges remain uncollected? _____% (37)

(38)

Please indicate below the number and type of personnel now employed by you and their monthly salaries: (39-40)
(If you have more than one full-time employee *of one classification*, salary given should be the average. (41)
If you have a hygienist who works on commission, record her current monthly earnings.) (42)
(43-44)

	Number Full-time	Monthly Salaries of Full-time Employees	Number Part-time	(45)
				(46)
Dentists	_____	$_____	_____	
Hygienists	_____	_____	_____	(47-48)
Technicians	_____	_____	_____	(49)
Assistants (or nurses)	_____	_____	_____	(50)

(51-52)
(53)

The following questions apply to the year 1949. Where exact answers are not available, careful estimates are preferable to no answers.

How many different patients did you have in 1949? _____ (54-57)

Estimate what percentage of your patients in 1949 returned to receive all recommended dental care (58)

_____%

How many weeks did you work in your dental office in 1949? _____ (59-60)

How many weeks did you spend on vacation in 1949? _____ (61)

How many weeks did you spend in other activities in 1949? _____ (62-63)

TOTAL 52

What was your total laboratory bill for 1949? $_____ (64-65)

If you are participating in a prepayment plan, please enclose at least a brief description of it when you return this questionnaire.

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1950 SURVEY OF THE DENTAL PROFESSION, PART II

Summary of Practice*, April 16 through April 22

Hours you spent in dental office (or offices) during the week:

Chairside hours	_____	(66-67)
Laboratory hours	_____	(68-69)
Other hours working in the office	_____	(70-71)
Free hours in the office	_____	(72-73)
TOTAL	_____	(74-75)

How many different patients did you have during the week? _____ (76-77)

How many patient visits (sittings) did you have during the week? _____ (78-79)

Do you consider this week fairly typical of your practice? Yes☐; No☐. (80)

*Include charitable dental work and work in clinics.

WRITE HERE ANY COMMENTS OR CRITICISMS YOU HAVE ABOUT THIS SURVEY:

Record of Dental Work Performed, April 16 through April 22

Use only one line for each patient, even though some patients may return for a second or a third visit during the week.

List the sex and age (estimate age if necessary) *of every patient* treated by you or your auxiliary personnel, *excluding other dentists.* (In some cases it will not be necessary to record dental work performed because some types of operations are not listed. For instance, it will not be necessary to record taking an impression for a denture.) *Include work done in clinics and charitable dental work.*

We suggest you record your work on this sheet as it is completed, *in pencil* so that changes can be made if the patient returns during the week for more work of the same type.

The example indicates 2 cavities filled, 1 tooth extracted and 1 prophylaxis. The work was done for a 23-year-old male.

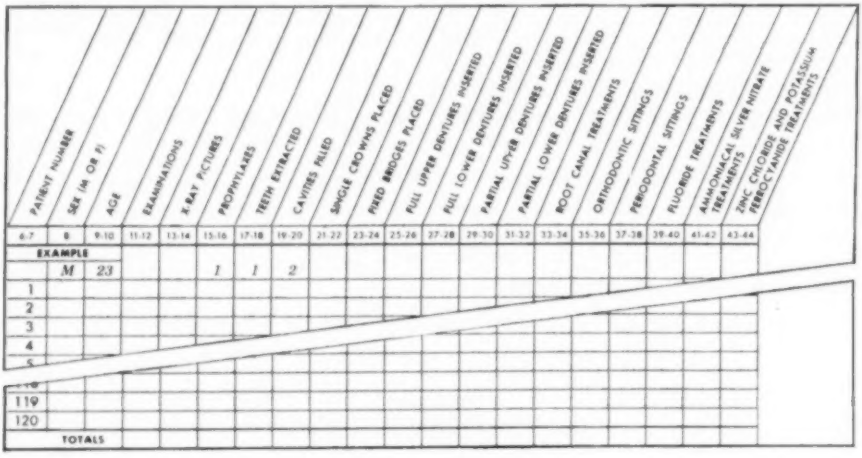

Table 1 • Geographical distribution of all dentists* and of dentists participating in the 1950 Survey of the Dental Profession

Region and state	Number of active respondents	Percentage distribution of respondents	Percentage distribution of all dentists*
New England	226	6.1	7.5
Connecticut	54	1.4	1.8
Maine	16	0.4	0.5
Massachusetts	122	3.3	4.1
New Hampshire	13	0.4	0.3
Rhode Island	17	0.5	0.6
Vermont	4	0.1	0.2
Middle East	1,057	28.4	30.8
Delaware	6	0.2	0.1
Dist. of Columbia	36	1.0	0.9
Maryland	39	1.0	1.0
New Jersey	146	3.9	3.8
New York	537	14.4	16.4
Pennsylvania	260	7.0	7.8
West Virginia	33	0.9	0.8
Southeast	350	9.4	10.8
Alabama	23	0.6	0.8
Arkansas	23	0.6	0.5
Florida	47	1.3	1.4
Georgia	25	0.7	1.1
Kentucky	44	1.2	1.1
Louisiana	27	0.7	1.2
Mississippi	19	0.5	0.6
North Carolina	37	1.0	1.2
South Carolina	13	0.3	0.5
Tennessee	45	1.2	1.2
Virginia	47	1.3	1.2
Southwest	147	3.9	4.2
Arizona	13	0.3	0.3
New Mexico	9	0.2	0.2
Oklahoma	33	0.9	1.0
Texas	92	2.5	2.7
Central	1,190	31.9	29.6
Illinois	294	7.9	7.4
Indiana	92	2.5	2.3
Iowa	82	2.2	2.0
Michigan	180	4.8	4.0
Minnesota	143	3.8	2.8
Missouri	98	2.6	3.1
Ohio	186	5.0	5.0
Wisconsin	115	3.1	3.0
Northwest	224	6.0	5.2
Colorado	42	1.1	0.9
Idaho	15	0.4	0.3
Kansas	42	1.1	1.2
Montana	22	0.6	0.4
Nebraska	44	1.2	1.1
North Dakota	15	0.4	0.3

South Dakota	14	0.4	0.4
Utah	27	0.7	0.5
Wyoming	3	0.1	0.1
Far West	532	14.3	11.9
California	406	10.9	8.6
Nevada	5	0.1	0.1
Oregon	49	1.3	1.3
Washington	72	2.0	1.9
TOTAL	3,726	100.0	100.0

*As of mid-1949. Excludes dentists in federal government dental services.

respondents are representative of the entire body of United States dentists. It is possible partially to answer this question by the use of existing statistics in three areas: distribution of dentists according to location, age and membership in the American Dental Association.

The geographical distribution of respondents was very similar to the distribution of all dentists, as may be seen from Table 1 and Figure 1. There was a slight underrepresentation in the New England, Middle East, Southeast and Southwest regions, and a slight overrepresentation in the Central, Northwest and Far West regions.

The ages of respondents also corresponded rather well with the ages of den-

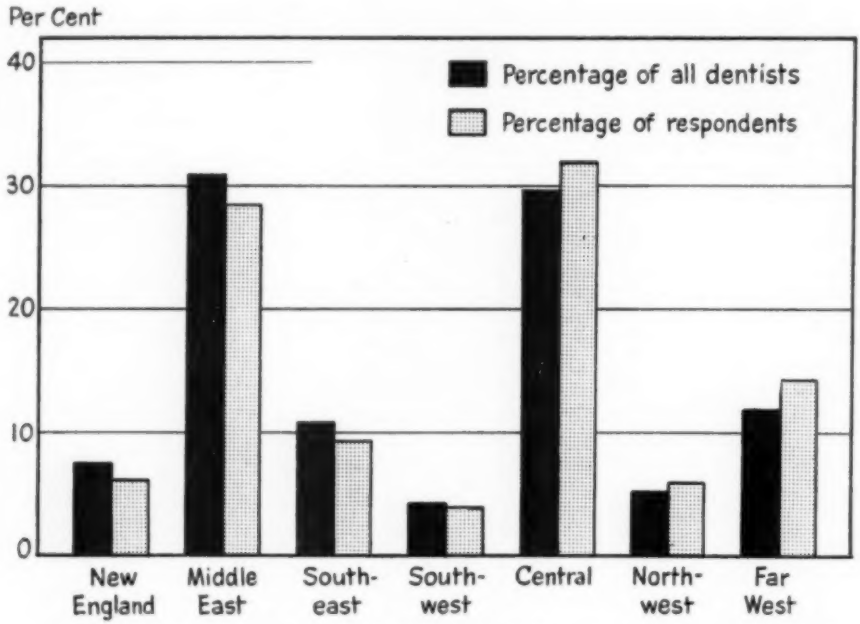

Fig. 1 • Comparison of regional distribution of all dentists with regional distribution of dentists participating in the 1950 Survey of the Dental Profession (data from Table 1)

tists in general, as determined from a large random sample taken from a file of all living dentists in mid-1949. Table 2 and Figure 2 indicate that dentists under 50 were somewhat more cooperative as a group than were dentists 50 and over (with the exception of dentists under 25). It seems probable that retired dentists, comprising only 3 per cent of the net sample, were inclined to disregard the questionnaire. Because retired dentists are at or near an extreme of the age distribution, any underrepresentation of them has a marked effect on the distribution and on averages derived from it. Insofar as the failure of retired dentists to respond accounts for the age discrepancy, that discrepancy may be ignored, as the active dentists will be separately analyzed as the principal part of the report.

The net sample is rather heavily weighted with members of the American

Table 2 • Age distribution of dentists in the United States* and age distribution of dentists participating in the 1950 Survey of the Dental Profession

Age	Age distribution of respondents					Percentage distribution of dentists in the U.S.*
	Active dentists	In other occupations	Retired	Total	Per cent	
Under 25	12	–	–	12	0.32	0.63
25-29	368	1	–	369	9.79	7.33
30-34	496	2	–	498	13.21	10.35
35-39	480	3	–	483	12.81	10.88
40-44	541	–	1	542	14.38	13.03
45-49	507	1	3	511	13.56	13.70
50-54	458	–	5	463	12.28	13.63
55-59	386	1	6	393	10.43	10.62
60-64	171	1	16	188	4.99	6.78
65-69	109	1	18	128	3.40	5.31
70-74	74	–	21	95	2.52	4.39
75 & over	46	1	40	87	2.31	3.35
TOTAL	3,648	11	110	3,769	100.00	100.00
No answ.	78	3	13	94		

*As determined in mid-1949 from a large random sample of dentists.

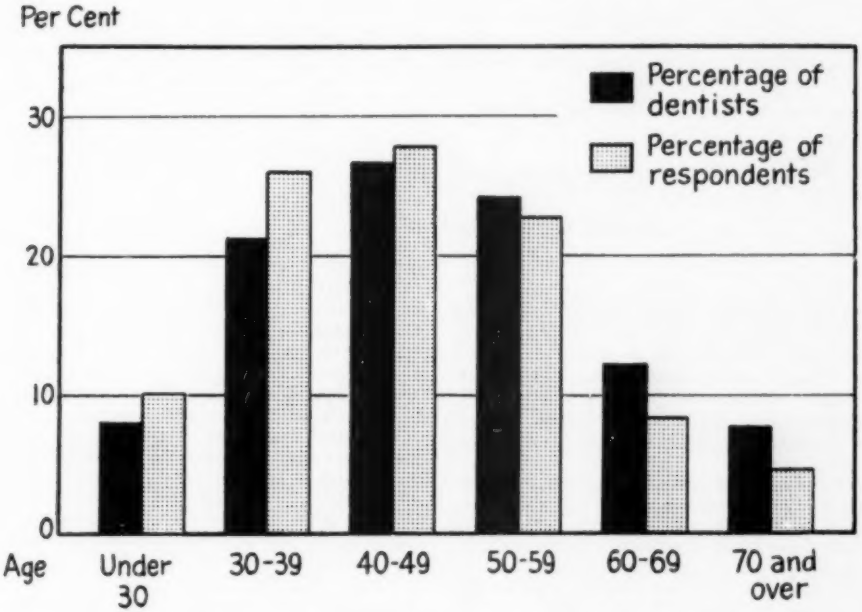

Fig. 2 • Comparison of age distribution of dentists in the United States with age distribution of dentists participating in the 1950 Survey of the Dental Profession (data from Table 2)

Dental Association. Approximately 95 per cent of the respondents said they were members of the Association in 1949, when about 80 per cent of all dentists were members. Therefore, wherever averages for members differ markedly from averages for nonmembers, separate tables will be presented. Results of other surveys indicate that substantial differences are to be expected with respect to some factors.

A space was provided on the questionnaire for comments and criticisms by the respondent. Favorable comments greatly outnumbered the unfavorable. The most common criticism was that space was not allowed for "nonterminal" dental work, such as cavity preparation and denture sittings preceding actual insertion of dentures. It was not obvious to these respondents that the amount of preparatory work could be inferred from the amount of completed work done by a group of dentists. Some of these dentists thought of the survey as a "time study," whereas actually the questionnaire did not allow calculation of time required for any particular type of operation.

A number of dentists commented that they looked forward to the results of the survey as these would provide standards against which they could measure their own practice. Others considered the keeping of detailed records for a week to be a rewarding experience in itself, as it gave them a new perspective of their practice. But most of the comments were a recognition of the fact that organized dentistry needed to be well armed with facts.

The next article in this series will present data on the dentist, his training and his practice. It will appear in September.

B. Duane Moen, Assistant Director.
Leslie M. FitzGerald, Chairman, Advisory Committee.

COUNCIL ON HOSPITAL DENTAL SERVICE

Approved hospital dental departments

At the American Dental Association meeting held in September 1948, the title of the Hospital Dental Service Committee was changed to Council on Hospital Dental Service. The Council members for 1950 are: Edward C. Dobbs, Chairman; W. Harry Archer, Stephen P. Mallett, Timothy A. Hardgrove and Russell A. Sand.

Practically all states have a Hospital Dental Service Committee within their respective state societies. Members of these committees have been asked to serve as examiners of the hospital dental departments within their jurisdiction. Their cooperation is greatly appreciated.

Throughout the United States many new hospitals are under construction; old established hospitals are expanding and reorganizing to meet the increasing demands for hospitalization. They all provide means for enlarging the space and personnel of the dental departments in accordance with the "Basic Standards for Hospital Dental Service" as set up by the American Dental Association.

The "Basic Standards" provides for six sections under the department of dentistry, and recommends that each hospital establish as many sections as are necessary to provide an adequate dental service in their particular type hospital. The recommended sections are: (1) Oral Surgery; (2) Dentistry for Children; (3) Restorative Dentistry; (4) Periodontics; (5) Dental Roentgenology, and (6) Oral Pathology.

Hospitals considering certification of their department of dentistry should acquaint them-

selves with the "Basic Standards," a copy of which may be obtained from the Council's chairman.

Some of the cardinal requirements for certifications are: (1) the title of the department responsible for the hospital dental service should be "The Department of Dentistry" or some similar title containing the word dentistry or dental, consistent with those used for divisions of service within the given hospital; (2) the department of dentistry should have autonomy and be organized under the direction of a dentist; (3) patients hospitalized primarily for the treatment of oral conditions should be admitted in the name of a dentist and on the dental service; (4) the space allotted to the department of dentistry, the equipment, instruments and supplies of the department should be adequate for the services offered, and (5) the dental staff should be sufficient in number and qualification to maintain an adequate dental service and to train junior staff members and interns.

Following is a roster of hospitals with approved dental departments.

ALABAMA

Jefferson Memorial Hospital, Birmingham 5. J. F. Volker, D.D.S., Dean, Dental School

ARKANSAS

Arkansas State Hospital for Nervous and Mental Diseases, Little Rock. J. M. Fowler, D.D.S., Chief, Dental Service

CALIFORNIA

General Hospital of Fresno County, Fresno 16. A. W. Pearson, Jr., D.D.S., Chief, Dental Service

San Diego County General Hospital, San Diego. E. I. Stephenson, D.D.S.

Jackson Memorial Hospital, Miami 36. J. H. Beckwith, D.D.S., Chief, Dental Service

CONNECTICUT

Norwich State Hospital, Norwich. E. C. Kirby, D.D.S., Chief, Dental Department

The Hartford Hospital, Inc., Hartford, W. R. Conran, D.D.S., Director, Dental Department

DELAWARE

The Delaware Hospital, Inc., Wilmington. E. P. Shamborsky, D.D.S., Chief, Dental Service

DISTRICT OF COLUMBIA

The Central Dispensary and Emergency Hospital, Washington 6. H. W. Krogh, D.D.S., Chief, Dental Service

Episcopal Eye, Ear and Throat Hospital, Washington 5. H. W. Krogh, D.D.S., Chief, Dental Service

Gallinger Municipal Hospital, Washington 3. A. Merril, D.D.S., Dental Officer

The George Washington University Hospital, Washington 7. H. W. Krogh, D.D.S., Chief, Dental Department

FLORIDA

Florida State Hospital, Chattachooche 3. A. F. Douglas, D.D.S., Chief, Dental Service

ILLINOIS

The Carle Foundation and Carle Memorial Hospital, Urbana-Champaign. E. C. Thompson, D.D.S., Chief, Oral Surgery

University of Chicago Clinics, Chicago. J. R. Blayney, D.D.S., Chief, Dental Service

Research and Educational Hospital, University of Illinois, Chicago 12. M. Mausler, D.D.S., Chief, Dental Department

Peoria Municipal Tuberculosis Sanitarium, Peoria 1. D. H. Fraser, D.D.S., Chief, Dental Service

INDIANA

The Indianapolis General Hospital, Indianapolis. J. T. Waldo, D.D.S., Chief, Dental Staff

KANSAS

University of Kansas Medical Center, Kansas City. R. W. Edwards, D.D.S., Chief, Dental Staff

KENTUCKY

Louisville General Hospital, Louisville. R. M. Herd, D.D.S., Director, Dental Department

MARYLAND

Baltimore City Hospital, Baltimore. H. G. Waring, D.D.S., Chief, Dental Service

Johns Hopkins Hospital, Baltimore. B. L. Brun, D.D.S., Director, Dental Department

Sinai Hospital of Baltimore, Inc., Baltimore 5. A. H. Berman, D.D.S., Chief, Dental Department

University Hospital, Baltimore 1. B. M. Dorsey, D.D.S., Chief, Dental Department

MASSACHUSETTS

The Boston City Hospital, Boston. S. P. Mallett, D.M.D., Chief, Dental Staff

The Children's Hospital, Boston. P. K. Losche, D.D.S., Chief, Division of Dentistry

Massachusetts General Hospital, Boston. K. H. Thoma, D.M.D., Chief, Dental Department

Worcester City Hospital, Worcester 3. L. A. Storz, D.M.D., Chief, Oral Surgeon

Peter Bent Brigham Hospital, Boston 15. Moses Lostrock, D.M.D., Chief, Dental Service

Massachusetts Memorial Hospital, Boston 18. R. N. Norton, D.M.D., Chief, Dental Service

Blodgett Memorial Hospital, Grand Rapids. N. L. Burk, D.D.S., Chief, Dental Service

MISSOURI

Kansas City Hospital, Kansas City. M. Curran, D.D.S., Chief, Dental Staff

NEBRASKA

Children's Memorial Hospital, Omaha. Edmund Dailey, D.D.S., Chief, Dental Service

NEW JERSEY

Monmouth Memorial Hospital, Long Branch. L. Reisner, D.D.S., Chief, Dental Department

New Jersey State Hospital, Trenton 8. F. J. Fischer, D.D.S., Director, Dental Department

Jersey City Medical Center, Jersey City. F. J. Houghton, D.D.S., Dental Director

North Hudson Hospital, Weehawken. M. J. Boyer, D.D.S., Attending Dental Chief

Hackensack Hospital Association, Hackensack. B. M. Nielsen, D.D.S., Director, Dental Service

NEW YORK

Beth Israel Hospital, New York City. I. Salman, D.D.S., Director, Dental Department

Bronx Hospital, New York City. S. B. Gerstner, D.D.S., Director, Dental Department

Gouverneur Hospital, New York City. B. Klug, D.D.S., Visiting Dental Surgeon

Grasslands Hospital, Valhalla. B. H. Weeth, D.D.S., Chief, Dental Department

Harlem Hospital, New York City. L. H. Fairclough, D.D.S., Visiting Dental Surgeon

Bellevue Hospital, New York City. W. Rosenbaum, D.D.S., Director, Dental Department

Jewish Sanitarium and Hospital for Chronic Diseases, Brooklyn. L. Kohn, D.D.S., Chief, Dental Staff

Jewish Memorial Hospital, Inc., New York City 34. J. Schroff, D.D.S., Attending Oral Surgeon

Lenox Hill Hospital, New York City. F. S. Dunn, D.D.S., Attending Oral Surgeon

Metropolitan Hospital, New York City. M. W. Carr, D.D.S., Director, Oral Surgery

Sydenham Hospital, New York City. H. L. Reiss, D.D.S., Attending Oral Surgeon

Montefiore Hospital, New York City. D. Tanchester, D.D.S., Attending Dentist

New York Medical College, Flower and Fifth Avenue Hospitals, New York City. M. W. Carr, D.D.S., Acting Director, Dental Department

New York Polyclinic Medical School and Hospital, New York City. E. Whynnan, D.D.S., Chief, Dental Department

The Jewish Hospital of Brooklyn, Brooklyn. M. D. Levin, D.D.S., Attending Director, Dental Department

Roswell Park Memorial Institute, Buffalo. H. A. Solomon, Director, Dental Department

Cumberland Hospital, Brooklyn. G. B. Johnson, D.D.S., Director

Mary Immaculate Hospital, Jamaica, L. I. J. J. Stahl, D.D.S., Attending dentist

Sea View Hospital, Staten Island. I. E. Gruber, D.D.S., Director, Dental Department

St. Luke's Hospital, New York City 25. M. W. Carr, D.D.S., Chief, Dental Department

Strong Memorial Hospital, Rochester 7. E. J. Pammenter, D.D.S., Asso. Dental Surgeon

Hospital for Joint Diseases, New York 35. Adolph Berger, D.D.S., Chief, Dental Service

Buffalo General Hospital, Buffalo 3. C. A. Pankow, D.D.S., Chief, Dental Service

The Roosevelt Hospital, New York 19. C. A. Dunn, D.D.S., Chief, Dental Service

Mount Sinai Hospital, New York City 29. Leo Stern, D.D.S., Chief, Dental Service

NORTH CAROLINA

North Carolina Baptist Hospital, Winston-Salem. J. C. Watkins, D.D.S., Dental Director

City Hospital, Winston-Salem. J. C. Watkins, D.D.S., Chief, Dental Service

OHIO

Cleveland State Hospital, Cleveland. A. H. Wichert, D.D.S., Director, Dental Department

Mount Sinai Hospital, Cleveland 6. Edward Reiter, D.D.S., Chief, Dental Service

The Cleveland Clinic Foundation, Cleveland 6. P. J. Aufderheide, D.D.S., Chief, Dental Service

St. Vincent's Charity Hospital, Cleveland. Leonard L. F. Pendergast, D.D.S., Chief, Dental Service

Saint Luke's Hospital Association, Cleveland. C. P. Titus, D.D.S., Chief, Dental Service

Youngstown Hospital Assn., Youngstown. W. F. Fames, D.D.S., Chief, Dental Staff

PENNSYLVANIA

Children's Hospital of Pittsburgh, Pittsburgh. C. W. Hagan, D.D.S., Chief, Dental Service

Elizabeth Steel Magee Hospital, Pittsburgh. W. H. Archer, D.D.S., Chief, Dental Department

The George F. Geisinger Memorial Hospital, Danville. J. B. Smith, D.D.S., Director, Dental Department

Guthrie Clinic, Sayre. G. F. Carling, D.D.S., Chief, Dental Service

The Jewish Hospital Association of Philadelphia, Philadelphia. G. C. Tassman, D.D.S., Chief, Dental Service Staff

Pennsylvania Hospital, Philadelphia. J. R. Cameron, D.D.S., Chief, Dental Service

The Lancaster General Hospital, Lancaster. C. V. Snyder, D.D.S., Chief, Dental Department

St. Francis Hospital, Pittsburgh. R. G. Engler, D.D.S., Senior Dental Surgeon

The Western Pennsylvania Hospital, Pittsburgh. J. A. Gardner, D.D.S., Chief, Dental Department

The Presbyterian Hospital, Pittsburgh. L. E. VanKirk, D.D.S., Chief, Dental Service

Western State Psychiatric Institute and Clinic, Pittsburgh. W. H. Archer, D.D.S., Chief, Dental Department

The Germantown Dispensary and Hospital, Germantown, Philadelphia 44: W. J. C. Smith, D.D.S., Chief, Dental Service

Jefferson Medical College Hospital, Philadelphia. E. R. Sausser, D.D.S., Chief, Dental Department

Mount Sinai Hospital, Philadelphia 47. V. Frank, D.D.S., Attending Chief, Dental Staff

Philadelphia General Hospital, Philadelphia 4. J. R. Cameron, D.D.S., Chief, Dental Service

Bryn Mawr Hospital, Bryn Mawr. John H. Stine, D.D.S., Chief, Dental Service

RHODE ISLAND

State Hospital for Mental Diseases, Howard. L. C. England, D.D.S., Resident Dentist

Memorial Hospital, Pawtucket. N. Fortier, D.D.S., Chief, Dental Service

Rhode Island Hospital, Providence 2. G. H. Denicourt, D.M.D., Chief, Dental Service

TENNESSEE

Knoxville General Hospital, Knoxville 17. H. M. Underwood, D.D.S., Chief, Dental Department

U. S. ARMY

Brooke General Hospital, Fort Sam, Houston, Texas. W. C. Caldwell, D.D.S., Dental Chief

Letterman General Hospital, San Francisco, Cal. B. L. Smith, D.D.S., Chief, Dental Service

Oliver General Hospital, Augusta, Ga. H. G. Ott, D.D.S., Chief, Dental Service

Percy Jones General Hospital, Battle Creek, Mich. J. H. Pence, D.D.S., Chief, Dental Service

Fitzsimons General Hospital, Denver, Colo. O. P. Snyder, D.D.S., Chief, Dental Service

Walter Reed General Hospital, Washington, D. C. W. F. Schumann, D.D.S., Chief, Dental Service

Murphy General Hospital, Waltham 54, Mass. Col. E. Milburn, D.D.S., Chief, Dental Service

Valley Forge General Hospital, Phoenixville, Pa. Col. R. A. Stout, D.D.S., Chief Dental Service

Army and Navy General Hospital, Hot Springs National Park, Arkansas. William B. Steward, D.D.S., Chief, Dental Service

U. S. NAVY

U. S. Naval Dental School, National Naval Medical Center, Bethesda, Md. L. D. Mitchell, Jr., D.D.S., Dental Officer in Command

U. S. Naval Hospital, Annapolis, Md. E. J. Jerden, D.D.S., Chief, Dental Staff

U. S. Naval Hospital, Philadelphia, Pa. C. F. Hoyt, D.D.S., Chief, Dental Service

U. S. Naval Hospital, Newport, R. I. A. Knox, D.D.S., Chief, Dental Service

U. S. Naval Hospital, St. Albans, Long Island, N. Y. N. M. Maxwell, D.D.S., Chief, Dental Service

U. S. Naval Hospital, Guam, M. I. W. Seidel, D.D.S., Senior Dental Officer

U. S. Naval Hospital, San Diego, Cal. A. R. Long, D.D.S., Chief, Dental Service

U. S. Naval Hospital, Great Lakes, Ill. T. V. Joseph, Chief, Dental Service

U. S. Naval Hospital, Oakland, Calif. G. H. Mills, D.D.S., Chief, Dental Service

U. S. Naval Hospital, Chelsea 40, Mass. W. D. F. Stagner, D.D.S., Chief, Dental Service

U. S. Naval Hospital, Quantico, Va. M. E. Simpson, D.D.S., Chief, Dental Service

U. S. Naval Hospital, Long Beach 4, Cal. J. B. Baneroft, D.D.S., Chief, Dental Service

U. S. Naval Hospital, Portsmouth, Va. J. L. Purcell, D.D.S., Chief, Dental Service

U. S. PUBLIC HEALTH SERVICE

U. S. Marine Hospital, Norfolk 9, Va. William C. Neaff, D.D.S., Chief, Dental Service

U. S. Marine Hospital, Staten Island, New York. R. H. Moore, D.D.S., Chief, Dental Service

U. S. Marine Hospital, Brighton 35, Mass. William O. Boss, D.D.S., Chief, Dental Service

U. S. Marine Hospital, Chicago 13, Ill. L. R. Etzenhouse, D.D.S., Dental Director

U. S. Marine Hospital, Seattle 14, Wash. G. E. Jones, D.D.S., Sr., Dental Surgeon

U. S. Marine Hospital, Baltimore 11, Md. R. S. Lloyd, D.D.S., Chief, Dental Service

U. S. Marine Hospital, Cleveland 20, Ohio. J. W. Holt, D.D.S., Sr., Dental Officer

U. S. Marine Hospital, San Francisco, Cal. F. R. Jackson, D.D.S., Chief, Dental Service

VETERANS ADMINISTRATION

V. A. Hospital, Coral Gables, Fla. R. A. Williams, D.D.S., Chief, Dental Service

V. A. Hospital, Indianapolis 44, Ind. C. Newman, D.D.S., Chief, Dental Service

V. A. Hospital, Tuskegee, Ala. Clifton O. Dummett, D.D.S., Chief, Dental Service

V. A. Hospital, Amarillo, Texas. Charles A. Wandell, D.D.S., Chief, Dental Service

V. A. Hospital, Providence 8, R. I. B. H. Sawyer, D.M.D., Chief, Dental Service

V. A. Hospital, Dearborn, Mich. H. L. Dute, D.D.S., Chief, Dental Service

V. A. Center, Dayton, Ohio. C. A. Logsdon, D.D.S., Chief, Dental Service

V. A. Hospital, Downey, Ill. W. R. Cressey, D.D.S., Chief Dental Service

Thayer V. A. Hospital, Nashville, Tenn. L. D. Heacock, D.D.S., Chief, Dental Service

V. A. Hospital, North Little Rock, Ark. L. Hilton, D.D.S., Chief, Dental Service

V. A. Hospital, Fayetteville, Ark. F. D. Knox, D.D.S., Chief, Dental Service

V. A. Hospital, Fort Logan, Colo. K. Martin, D.D.S., Chief, Dental Service

V. A. Hospital, Dwight, Ill. W. L. Westling, D.D.S., Chief, Dental Service

V. A. Hospital, Oteen, N. C. J. H. Archer, D.D.S., Chief, Dental Service

V. A. Hospital, Fort Custer, Mich. E. W. Stevens, Chief, Dental Service

COUNCIL ON DENTAL THERAPEUTICS

Council announces classification of additional products

The classification of products by the Council on Dental Therapeutics of the American Dental Association has been described in a previous report (*J.A.D.A.* 40:489, April, 1950). The Council's program now provides for classification of products in Group A, Group B, Group C and Group D. Products are reconsidered periodically and decisions are subject to change at any time that a substantial amount of new evidence becomes available. The files of the Council contain information on many drugs and dental cosmetics, and inquiries are welcome.

GROUP A

Listing of products in Group A means that at the time of their consideration, the items conformed with the provisions of acceptance established by the Council on Dental Therapeutics and adopted by the Board of Trustees of the American Dental Association. Items in this group will be listed in *Accepted Dental Remedies*, and may use the Seal of Acceptance, unless otherwise provided.

The following additional products are classified in Group A:

"Mann" Germicidal Solution ("Mann" Chemical Corp.): Benzalkonium chloride, 0.5 per cent; sodium nitrite, 0.5 per cent; water and color. See *A.D.R.*, ed. 15, p. 50.

Procaine HCl 4%, Epinephrine 1:50,000, Guild Brand (Anesthetic Laboratories): Each cc. is stated to contain procaine, 0.04 Gm.; epinephrine, 0.00002 Gm.; sodium chloride, 0.0037 Gm.; sodium bisulfite, 0.0019 Gm.; chlorobutanol, 0.005 Gm., and distilled water. See *A.D.R.*, ed. 15, p. 27.

Aluminum Penicillin Oral Tablets, 50,000 Units (Hynson, Westcott and Dunning): Each oral tablet is stated to contain aluminum penicillin, 50,000 units, and sodium benzoate, 0.3 Gm. See *A.D.R.*, ed. 15, p. 40. (For report, see this same page.)

GROUP B

Listing of products in group B means that there is insufficient evidence to justify their present acceptance, but there is reasonable evidence of their usefulness and safety. These products meet the other qualifications and standards established by the Council on Dental Therapeutics and the Bureau of Chemistry. It is the Council's opinion that group B products may be promoted for special use and study.

No products are listed in group B at the present time.

GROUP C

Listing of products in group C means that the evidence is so limited or inconclusive that the products cannot be accurately evaluated. It is the Council's opinion that group C products require further study by qualified investigators.

GROUP D

Listing of products in group D means that they are unacceptable because of their demonstrated inability to meet the standards outlined in the provisions for acceptance.

Council classifies aluminum penicillin preparation in class A

The announcement of classification of Aluminum Penicillin Oral Tablets—Hynson, Westcott and Dunning in Group A appears on this same page.

Aluminum penicillin is said to be the trivalent aluminum salt of penicillin. Each oral tablet contains 50,000 units of aluminum penicillin and 0.3 gram of sodium benzoate. Therapeutic indications and dosage are stated to be similar to those for other oral penicillin products. It is said that the salt, aluminum penicillin, is not dissolved in solutions at a pH level that corresponds to that of gastric juice and therefore the penicillin is not inactivated in the stomach.

With the above-noted exception, aluminum penicillin oral tablets are similar to other previously accepted oral penicillin preparations.

Standards for aluminum penicillin and tablets aluminum penicillin have been published in the *Federal Register* by the Food and Drug Administration.

Deaths

Adams, Bert M., Jackson, Mich.; College of Dental Surgery, University of Michigan, 1913; died May 5; aged 77.

Anderson, Morley W., Marquette, Mich.; Dental School, Northwestern University, 1901; died April 28; aged 76.

Arnold, Squire, Chicago; Chicago College of Dental Surgery, 1898; died March 29.

Arnstein, Alvin L., Chicago; Chicago College of Dental Surgery, 1924; died April 10; aged 49.

Azbill, S. V., Red Bush, Ky.; died April 30; aged 62.

Balauri, Samuel D., St. Louis; School of Dentistry, St. Louis University, 1919; died March 24; aged 64.

Banta, Frank C., Denver; Kansas City Dental College, 1902; died April 28.

Barnhard, James L., Washington, D. C.; School of Dentistry, Georgetown University, 1922; died April 16; aged 49.

Barrett, Francis L., Wheeling, W. Va.; School of Dentistry, Georgetown University, 1924; died May 9; aged 50.

Beach, Russell H., Lynwood, Calif.; died April 16; aged 71.

Beal, Samuel T., Santa Rosa, Calif.; died April 1; aged 81.

Beaumont, William G., Spokane, Wash.; School of Dentistry, University of Buffalo, 1899; died March 29; aged 75.

Bell, Braxton B., Hollis, Okla.; Louisville College of Dentistry of Centre College, 1904; died April 17; aged 70.

Bennion, Sydney E., Hutchinson, Minn.; College of Dentistry, University of Minnesota, 1898; died March 27; aged 75.

Birch, Frank W., Minneapolis; College of Dentistry, University of Minnesota, 1896; died March 28; aged 76.

Botthoff, Jacob T., Houston, Texas; Texas Dental College, 1926; died April 12; aged 51.

Brady, Harold J., Chicago; Dental School, Northwestern University, 1921; died May 17; aged 55.

Brame, George C., Little Rock, Ark.; New Orleans College of Dentistry, 1902; died April 2; aged 70.

Brown, L. Read., Miami, Fla.; died in June; aged 79.

Buntin-Becker, Anna L., Mariemont, Ohio; School of Dentistry, Western Reserve University, 1919; died April 13; aged 59.

Burzynski, Walter E., Milwaukee; Dental School, Marquette University, 1925; died April 14; aged 47.

Cameron, Clarke J., Cherry Tree, Pa.; School of Dentistry, Temple University, 1885; died April 27; aged 94.

Campbell, Harold F., Columbiana, Ohio; School of Dentistry, University of Pennsylvania, 1927; died April 11; aged 52.

Caplin, Abel A., St. Louis; School of Dentistry, St. Louis University, 1914; died April 6; aged 52.

Capps, Herbert E., Pasadena, Calif.; College of Dentistry, University of Southern California, 1897; died March 27; aged 52.

Carr, Marcus, Bethlehem, Pa.; Baltimore College of Dental Surgery, University of Maryland, 1923; died March 29; aged 54.

Carter, Francis A., Chicago; American College of Dental Surgery, 1888; died March 31; aged 94.

Chinn, William C., Toledo, Ohio; Philadelphia Dental College, 1898; died April 29.

Clarke, William A., Atlanta, Ga.; Southern Dental College, 1915; died February 17; aged 57.

Cleophas, Gustav E., Beloit, Wis., Chicago College of Dental Surgery, 1897; died May 8; aged 78.

Cochrane, James A., Keokuk, Iowa; Keokuk Dental College, 1901; died April 14; aged 73.

Coe, Glenn E., Watertown, N. Y.; Pennsylvania College of Dental Surgery, 1900; died March 31; aged 72.

Combs, Harry J., Evanston, Ill.; Chicago College of Dental Surgery, 1895; died April 18.

Comley, Henry J., Irvine, Ky.; Louisville College of Dentistry of Centre College, 1917; died May 5; aged 58.

Connley, John E., Latonia, Ky.; Cincinnati College of Dental Surgery, 1899; died March 26; aged 71.

Cook, Thomas E., Atlanta, Ga.; Atlanta Southern Dental College, 1914; died February 25; aged 61.

Copp, George V., St. Petersburg, Fla.; died April 3; aged 88.

Crockett, Earl G., Upton, Mass.; Dental School, Harvard University, 1915; died April 17; aged 56.

Cronin, Harry J., Portsmouth, N. H.; died March 18; aged 59.

Cruise, Robert J.; Chicago; Chicago College of Dental Surgery, 1898; died March 30.

Daniel, Beverly C., Ontario, Ore.; died March 30; aged 50.

Davis, Harold E., Dunmore, Pa.; School of Dentistry, University of Pennsylvania, 1909; died March 21.

Delaney, Edward J., Westerly, R. I.; School of Dentistry, Georgetown University, 1932; died April 29; aged 56.

de Monseigle, Edmond F., Newport, N. H.; School of Dentistry, University of Pennsylvania, 1910; died May 17; aged 64.

Denison, Arthur E., Indianapolis; School of Dentistry, Indiana University, 1927; died May 9; aged 55.

Devine, Edwin K., Harmony, R. I.; Baltimore College of Dental Surgery, University of Maryland, 1923; died April 11; aged 54.

Dollin, James W., San Francisco; College of Physicians and Surgeons, 1909; died March 23; aged 69.

Donigan, Henry J., Arlington, Mass.; Dental School, Harvard University, 1919; died April 18; aged 59.

Dorr, Philip P., Fort Dodge, Iowa; Philadelphia Dental College, 1896; died April 26; aged 80.

Dosch, Henry R., Springfield, Ohio; died March 29; aged 92.

Dougan, William R., Somerset, Pa.; College of Dentistry, Ohio Medical University, 1904; died March 25; aged 73.

Dow, Lewis C., Marion Iowa; Dental School, Northwestern University, 1899; died April 6; aged 72.

Dowling, Hardee B., Ozark, Ala.; Atlanta Dental College, 1900; died April 22; aged 78.

Dumas, Martin L., Roswell, Ga.; Southern Dental College, 1904; died January 10; aged 69.

Eaton, Charles D., Mackinaw, Ill.; Dental School, Northwestern University, 1902; died April 7; aged 70.

Engel, Paul B.; Brooklyn; New York College of Dentistry, 1902; died April 15; aged 69.

Farnham, Walter J., Bucksport, Me.; died April 18; aged 79.

Farr, Seneca P., Hackensack, N. J.; School of Dentistry, University of Pennsylvania, 1914; died April 19; aged 57.

Ferris, Nial E., Cincinnati, Ohio; Ohio College of Dental Surgery, University of Cincinnati, 1917; died March 27; aged 58.

Finan, Austin L., New York; School of Dentistry, University of Pennsylvania, 1913; died May 3; aged 58.

Fisher, George N., Morgan Hill, Calif.; College of Dentistry, University of California, 1906; died April 21; aged 66.

FitzGerald, William T., Chicago; Chicago College of Dental Surgery, 1906; died March 7.

[illegible]ter, Frank B., Los Angeles; College of Dentistry, University of Southern California, 1917; died April 30; aged 55.

[illegible]riedman, Serena E., Cleveland; School of Dentistry, Western Reserve University, 1919; died May 3; aged 52.

Fritz, George F., Lykens, Pa.; School of Dentistry, Temple University, 1937; died May 3; aged 37.

Gale, John W., Lima, N. Y.; died March 27; aged 93.

Geisel, Earl L., Boswell, Pa.; School of Dentistry, University of Pittsburgh, 1917; died March 14; aged 60.

Glawe, Arthur E., Rock Island, Ill.; Chicago College of Dental Surgery, 1919; died April 29; aged 56.

Good, Bernard A., Chicago; Chicago College of Dental Surgery, 1915; died April 1; aged 65.

Goulding, Albert K., Akron, Ohio; College of Dentistry, Ohio State University, 1938; died April 28; aged 43.

Gregerson, Grant, Salt Lake City; Colorado College of Dental Surgery, 1918; died April 8; aged 61.

Grieb, Herbert E., San Francisco; College of Physicians and Surgeons, 1918; died April 3; aged 54.

Hamman, Lee M., El Monte, Calif.; Western Dental College, 1902; died March 21; aged 68.

Havley, John M., Torrington, Wyo.; Kansas City Western Dental College, 1913; died April 26; aged 81.

Hawkins, Frank J., Chicago; Dental Department, Meharry Medical College, 1916; died April 2; aged 65.

Holden, Percy S., Jersey City, N. J.; College of Dentistry, Howard University, 1917; died March 27; aged 56.

Holton, Leo S., Washington, D. C.; College of Dentistry, Howard University, 1923; died April 10; aged 52.

Hopkins, Lyman O., Sidney, Iowa; College of Dentistry, University of Iowa, 1919; died March 20; aged 51.

Horner, Harry J., Stoystown, Pa.; Pennsylvania College of Dental Surgery, 1896; died April 23; aged 79.

Hull, James T., Butler, Mo.; School of Dentistry, University of Louisville, 1892; died March 24; aged 82.

Jennings, John K., Washington, D. C.; School of Dentistry, Georgetown University, 1915; died May 6; aged 60.

Joffe, Maxwell S., Brooklyn; College of Dentistry, New York University, 1905; died May 3; aged 70.

Johnson, John B., Paterson, N. J.; School of Dentistry, Temple University, 1905; died April 8; aged 68.

Jones, Burton W., Troy, Ohio; Indiana Dental College, 1890; died April 7; aged 80.

Jones, David T., St. Louis Park, Minn.; Chicago College of Dental Surgery, 1901; died April 29; aged 73.

Jones, Perry H., Alva, Fla.; College of Dentistry, University of Iowa, 1896; died April 29; aged 82.

Kahn, Elkon H., Monett, Mo.; Ohio College of Dental Surgery, University of Cincinnati, 1902; died April 16; aged 69.

Kawahigashi, Denichi, Kalaluu, T. H.; Chicago College of Dental Surgery, 1932; died May 4; aged 42.

King, Herbert E., Omaha; Omaha Dental College, 1882; died May 11; aged 68.

Kowalsky, Herman E., Utica, N. Y.; New York College of Dentistry, 1915; died April 22; aged 57.

Kramer, Leon R., Topeka, Kan.; Kansas City Dental College, 1918; died May 21; aged 55.

Lange, Frank X., Dubuque, Iowa; College of Dentistry, University of Iowa, 1901; died April 12; aged 70.

Lauer, William J., Bismarck, N. D.; School of Dentistry, St. Louis University, 1918; died May 4; aged 56.

Lauterbach, Anthony T., Milwaukee; Dental School, Marquette University, 1927; died May 1; aged 49.

LeBlanc, Joseph O., Salem, Mass.; died April 12; age 60.

Lederer, Miriam E., Pottstown, Pa.; School of Dentistry, Temple University, 1939; died May 3; aged 33.

Linch, Michael, A., Atoka, Okla.; died February 11; aged 73.

Lowery, Emmet A., Jackson, Mich.; College of Dental Surgery, University of Michigan, 1909; died April 6; aged 65.

Marascio, Anthony W., Red Bank, N. J.; School of Dentistry, Western Reserve University, 1940; died May 18; aged 34.

Marshall, Pemberton J., Washington, D. C.; School of Dentistry, Georgetown University, 1902; died April 18; aged 70.

Marshall, Roy T., Columbus, Ind.; Indiana Dental College, 1910; died April 5; aged 62.

Maurer, Fred A., New York; died April 10.

McDonnell, John J., Throop, Pa.; School of Dentistry, University of Pittsburgh, 1911; died April 9.

McLin, Frank J., Boise, Idaho; died May 8; aged 75.

Meriam, Horatio C., Cornish, Me.; Dental School, Harvard University, 1913; died April 3; aged 60.

Michalski, Frank A., Milwaukee; Dental School, Northwestern University, 1902; died April 30.

Miller, Howard C., Chicago; College of Dentistry, Creighton University, 1916; died May 18; aged 56.

Miller, Richard A., Albany, Mo.; Kansas City Dental College, 1894; died March 14; aged 78.

Miller, Jesse, Maryville, Mo.; Kansas City Dental College, 1894; died April 5; aged 79.

Munns, Herbert A., Minneapolis; College of Dentistry, University of Minnesota, 1908; died April 23; aged 63.

Murray, Benjamin A., Denver; Dental School, Northwestern University, 1904; died April 11; aged 76.

Neely, William C., Elmwood, Wis.; School of Dentistry, Georgetown University, 1912; died April 7; aged 69.

Newell, Andrew J., Cooperstown, N. D.; Dental School, Northwestern University, 1918; died April 11; aged 58.

Niles, George C., Darby, Pa.; Chicago College of Dental Surgery, 1907; died April 3; aged 69.

Noling, Isaac O., South Orange, N. J.; School of Dentistry, Temple University, 1891; died June 3.

Oakley, Halbert D., Starkville, Miss.; Atlanta Dental College, 1908; died in March; aged 66.

O'Brien, Lawrence H., St. Louis; Barnes Dental College, 1905; died May 13; aged 72.

Osius, Charles R., Highland Park, Mich.; College of Dental Surgery, University of Michigan, 1891; died April 26; aged 81.

Packard, Abner B., Dorchester, Mass.; Dental School, Harvard University, 1905; died April 19; aged 67.

Parman, Jerome J., Eau Claire, Wis.; Dental School, Marquette University, 1946; died May 2; aged 26.

Parramore, Frank R., Valdosta, Ga.; Baltimore College of Dental Surgery, 1887; died January 14; aged 85.

Phillips, Thomas S., Springfield, Ohio; Ohio College of Dental Surgery, University of Cincinnati, 1896; died March 31; aged 81.

Pratt, Harry E., Grand Marais, Minn.; College of Dentistry, University of Minnesota,

1927; died April 8; aged 46.

Proseus, Frederick W., Rochester, N. Y.; Pennsylvania College of Dental Surgery, 1895; died April 9; aged 80.

Qualley, George R., Madison, Wis.; Dental School, Northwestern University, 1918; died March 31; aged 55.

Quinn, Clarence R., Chicago; Chicago College of Dental Surgery, 1922; died April 24.

Rimes, William F., Chicago; Dental School, Northwestern University, 1898; died March 5.

Ritenour, Willis Y., Mount Carroll, Ill.; Chicago College of Dental Surgery, 1915; died April 25; aged 63.

Robertson, James A., New York; College of Dental and Oral Surgery, 1908; died March 23.

Rosenburger, Harold D., Chicago; Chicago College of Dental Surgery, 1906; died February 23.

Routledge, John, Rome, Ga.; Atlanta Southern Dental College, 1933; died April 5; aged 62.

Rubey, S. C. A., Kansas City, Mo.; School of Dentistry, Vanderbilt University, 1886; died April 5; aged 83.

Runyan, Lewis N., Chicago; Dental School, Northwestern University, 1920; died April 10; aged 55.

Russianoff, Isidor, Brooklyn; College of Dental and Oral Surgery, 1905; died December 3.

Sanders, Hugh W., Savannah, Ga.; Atlanta Southern Dental College, 1918; died March 29; aged 52.

Sawhill, John A., Kansas City, Mo.; Western Dental College, 1905; died March 23; aged 69.

Saxon, Selmar W., New York; College of Dentistry, University of California, 1906; died in April.

Schiffman, Adolph, North Hollywood, Calif.; died March 30; aged 92.

Schwartz, Moses, Plainfield, N. J.; School of Dentistry, University of Pennsylvania, 1917; died November 27.

Seidner, Leo S., Chicago; Chicago College of Dental Surgery, 1920; died April 5; aged 60.

Sharp, William F., San Francisco; College of Dentistry, University of California, 1890; died March 26; aged 83.

Sherman, Thomas H., Hamilton, Mont.; died April 24; aged 81.

Shnayerson, Louis, Paterson, N. J.; College of Dental and Oral Surgery, 1905; died March 29; aged 70.

Shreve, Karl H., Evansville, Ind.; Indiana Dental College, 1900; died May 4; aged 75.

Simmonds, Clifford S., Auburn, N. Y.; School of Dentistry, University of Buffalo, 1913; died April 5.

Smith, Edward R., San Francisco; College of Dentistry, University of California, 1916; died April 15; aged 60.

Stoffel, Earl N., Wyoming, Iowa; Dental School, Northwestern University, 1901; died May 17; aged 70.

Swing, R. Hamill D., Philadelphia; School of Dentistry, University of Pennsylvania, 1887; died May 10; aged 84.

Treat, Jack C., LaGrange, Ill.; Chicago College of Dental Surgery, 1929; died April 18; aged 46.

Wheeler, Isaiah N., Hamilton, N. Y.; died April 28; aged 82.

Williams, Charles R., Los Angeles; Colorado College of Dental Surgery, 1919; died April 30; aged 53.

Williams, William S., Durant, Okla.; School of Dentistry, Vanderbilt University, 1898; died April 17; aged 83.

Willman, Arthur C., Kankakee, Ill.; Chicago College of Dental Surgergy, 1898; died May 18; aged 73.

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Announcements

AMERICAN DENTAL ASSOCIATION

Ninety-First Annual Session	Oct. 30-Nov. 2, 1950	Atlantic City, N. J.
Ninety-Second Annual Session	Oct. 15-18, 1951	Washington, D. C.
Ninety-Third Annual Session	Sept. 8-11, 1952	St. Louis

MEETINGS OF STATE SOCIETIES

State	Date	Place	Secretary	Address
Alabama	April 16-18, 1951	Birmingham	G. W. Matthews	1922 Tenth Ave., S., Birmingham 5
Alaska	Aug. 2-4	Anchorage	C. N. Hoveland	Anchorage
Arizona	April, 1951	Tucson	H. G. DeWolf	Valley National Bank Bldg., Tucson
Arkansas			D. M. Hamm	White Bldg., Clarksville
California	April 16-18, 1951	San Francisco	L. R. Ludwigsen	450 Sutter St., San Francisco
S. California	April 2-4, 1951	Los Angeles	C. A. Moss	1401 S. Hope St., Los Angeles
Colorado	Oct. 4-7	Colorado Springs	R. A. Downs	724 Republic Bldg., Denver 2
Connecticut			E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware	Jan. 10, 1951	Wilmington	L. Kreshtool	815 West St., Wilmington
District of Columbia	Mar. 11-14, 1951	Washington	K. H. Wood	202-1835 Eye St., N. W., Washington
Florida	Nov. 19-22	Hollywood	L. M. Schulstad	Professional Bldg., Bradenton
Georgia	Oct. 8-11	Atlanta	J. M. Heard, Jr.	Persons Bldg., Macon
Hawaii	Oct. 12-14	Honolulu	J. H. Dawe	810 N. Vineyard St., Honolulu 17
Idaho	June 26-28, 1951		A. R. Cutler	Eastman Bldg., Boise
Illinois	May 7-10, 1951	Peoria	P. W. Clopper	623 Jefferson Bldg., Peoria 2
Indiana	May 21-23, 1951	Indianapolis	E. E. Ewbank	Kingman
Iowa	May 7-9, 1951	Des Moines	H. I. Wilson	639 Insurance Exchange Bldg., Des Moines
Kansas	May 6-9, 1951	Wichita	F. A. Richmond	Brotherhood Bldg., Kansas City
Kentucky	April 2-4, 1951	Louisville	A. B. Coxwell	1976 Douglass Blvd., Louisville
Louisiana	April 26-28, 1951	New Orleans	J. S. Bernhard	407 Medical Arts Bldg., Shreveport
Maine	June 21-23, 1951	Rockland	F. P. Gilley	31 Central St., Bangor
Maryland	April 30-May 2, 1951	Baltimore	E. L. Pessagno, Jr.	415 Medical Arts Bldg., Baltimore 1
Massachusetts			H. E. Tingley	12 Bay State Road, Boston
Michigan	April 16-18, 1951	Detroit	F. Wertheimer	Michigan Dept. of Health, Lansing
Minnesota	Feb. 19-21, 1951	Minneapolis	C. V. E. Cassel	242 Lowry Medical Arts Bldg., St. Paul
Mississippi			F. C. Sneed	Osyka
Missouri	April 1-4, 1951	St. Louis	R. R. Rhoades	201 Merchants Bank Bldg., Jefferson City
Montana	May 3-5, 1951	Billings	C. S. Renouard	304 Phoenix Bldg., Butte
Nebraska	May 14-16, 1951	Lincoln	F. A. Pierson	Federal Securities Bldg., Lincoln
Nevada	June 1, 2, 1951	Reno	W. R. Bell	505 Chestnut St., Reno
New Hampshire			F. E. Williams	814 Elm St., Manchester
New Jersey			J. G. Carr	407 Cooper St., Camden
New Mexico			J. S. Eilar	First National Bank Bldg., Albuquerque
New York	May 7-11, 1951	Buffalo	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	April 30-May 2, 1951	Pinehurst	B. N. Walker	Liberty Life Bldg., Charlotte
North Dakota	May 17-20, 1951	Grand Forks	J. H. Lunday	Fargo
Ohio	Nov. 27-29	Cincinnati	E. G. Jones	185 E. State St., Columbus
Oklahoma	April 15-18, 1951	Oklahoma City	R. C. Calkin	109½ W. Oklahoma, Guthrie
Oregon			H. C. Fixott, Jr.	Medical-Dental Bldg., Portland
Panama Canal Zone			L. F. Baranowski	P. O. Box 102, Ft. Kobbe
Pennsylvania	Sept. 11-14, 1951	Pittsburgh	M. D. Zimmerman	217 State St., Harrisburg
Puerto Rico			J. F. Suarez	Box 3863, Santurce
Rhode Island	Jan. 1951	Providence	A. F. Sullivan	171 Westminster St., Providence 3
South Carolina	May 6-8, 1951		J. R. Owings	201 E. North St., Greenville
South Dakota	May 20-22, 1951	Watertown	E. W. Elmen	Sioux Falls
Tennessee	May 7-9, 1951	Nashville	E. J. Justis	Exchange Bldg., Memphis

State	Date	Place	Secretary	Address
Texas	Apr. 30-May 3, 1951	San Antonio	W. Ogle	310 N. Ervay St., Dallas
Utah			B. F. McBride	Medical Arts Bldg., Salt Lake City
Vermont			J. A. Larrow	Middlebury
Virginia	April 9-11, 1951	Richmond	J. E. John	804 Medical Arts Bldg., Roanoke
Washington			C. E. Flood	1130 Medical-Dental Bldg., Seattle 1
West Virginia	June 16-18, 1951	White Sulphur Springs	A. B. Drake	1202 West Virginia Bldg., Huntington
Wisconsin	Mar. 27-29, 1951	Milwaukee	R. A. Mason	964 N. 27th St., Milwaukee
Wyoming			T. A. Ward	326 Wyoming National Bank Bldg., Casper

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
Alabama			M. D. Edwards	120 Adams, Montgomery
Alaska	Aug. 28	Juneau	J. H. Geyer	Juneau
Arizona			R. K. Trueblood	25 N. Second Ave., Glendale
Arkansas			H. E. Hanna	Wilson Bldg., El Dorado
California			K. I. Nesbitt	507 Polk St., San Francisco 2
Colorado			W. D. McCarthy	724 Republic Bldg., Denver 2
Connecticut			C. G. Brooks Recorder	402 State St., New London
Delaware			P. K. Musselman	143 W. Main St., Newark
District of Columbia			W. M. Falls	1801 Eye St., N. W., Washington 6
Florida			A. W. Kellner	P. O. Box 155, Hollywood
Georgia			R. C. Coleman	State Capitol Bldg., Atlanta 3
Hawaii	Aug. 30-Sept. 4*	Honolulu	H. L. Houvener	7-8 Pantheon Bldg., Honolulu
Idaho	Aug. 1	Boise	F. L. Luce	510 First National Bank Bldg., Boise
Illinois	Oct. 3-6	Chicago	W. A. McKee	503 Wood Bldg., Benton
Indiana	Nov. 13-16*	Indianapolis	C. A. Frech	Gary National Bank Bldg., Gary
Iowa	Dec. 4-8*	Iowa City	H. M. Willits	719 Roshek Bldg., Dubuque
Kansas			G. L. Teall	Hiawatha
Kentucky			R. I. Todd	Western Union Bldg., Richmond
Louisiana			A. R. deNux	Marksville
Maine			R. A. Derbyshire	Box 387, Skowhegan
Maryland	Nov. 13-15		W. D. Day	3811 Hadley Square E., Baltimore 18
Massachusetts			J. C. Wilson	413 N. State House, Boston 33
Michigan	Jan. 28-Feb. 2, 1951	Ann Arbor	J. L. Champagne	3714 W. McNichols Road, Detroit 21
Minnesota	Jan. 8-12, 1951	Minneapolis	F. A. Larson	1632 Washington St., N. E., Minneapolis
Mississippi	Jan. 8-10, 1951	Jackson	J. C. Buswell	508 Lamar Bldg., Jackson
Missouri			R. R. Rhoades	Central Trust Bldg., Jefferson City
Montana			T. C. Betzner	301 Power Bldg., Helena
Nebraska			C. A. Bumstead	924 Stewart Bldg., Lincoln
Nevada	Dec. 4	Reno	G. C. Steinmiller	Masonic Temple, Reno
New Hampshire			J. B. Brown	5 N. State St., Concord
New Jersey	Dec. 11-15††	Philadelphia	W. A. Wilson	150 E. State St., Trenton 8
	Dec. 11-15**	Trenton		
	Dec. 11,12‡‡	Philadelphia		
New Mexico			J. J. Clarke, Sr.	Artesia
New York	Sept. 29-30§†	New York and Buffalo	O. W. Beier	23 S. Pearl St., Albany 7
	Oct. 3-6**†	New York, Buffalo, Syracuse and Albany		
	Sept. 30§‡	New York and Buffalo		
	Oct. 3-4**‡	New York and Buffalo		
North Carolina	June 25, 1951	Raleigh	F. O. Alford	1109 Liberty Life Bldg., Charlotte 2
North Dakota			W. J. Ford	Fargo
Ohio			F. D. Lowry	79 E. State St., Columbus

State	Date	Place	Secretary	Address
Oklahoma			N. D. Griffith	509 Medical Arts Bldg., Oklahoma City 2
Oregon			A. F. Davis Exec. Secy.	306 Public Service Bldg., Portland
Pennsylvania			R. E. V. Miller	Northampton National Bank Bldg., Easton
Rhode Island			F. M. Hackett	State Office Bldg., Providence
South Carolina			E. G. Bumgardner	1517 Hampton St., Columbia
South Dakota			R. W. Ellis	Salem
Tennessee	Dec. 11-15	Memphis	F. S. Maxey	804 Bennie Dillon Bldg., Nashville 3
Texas			R. T. Weber	312 Capital National Bank Bldg., Austin
Utah			J. J. Dalpiaz	Helper
Vermont			F. A. Reid	Windsor
Virginia	June 12, 1951	Richmond	J. M. Hughes	715 Medical Arts Bldg., Richmond 19
Washington			J. B. Kiefer, Jr.	510 Cobb Bldg., Seattle
West Virginia	June 25-27, 1951	West Liberty	C. A. Laughlin	613 Prunty Bldg., Clarksburg
Wisconsin			S. F. Donovan	Tomah
Wyoming			W. J. Ryan	208 Boyd Bldg., Cheyenne

*Dentistry and dental hygiene.
†Dentistry.
‡Dental hygiene.
§Practical examinations.
**Written examinations.
††Clinical examinations.

OTHER MEETINGS

Name	Date	City	Secy. or Chm.	Address
American Academy of Periodontology, Thirty-Fourth Annual Meeting	Oct. 26-28	Atlantic City, N. J.	C. E. Chamberlain Secy.	115 North St., Peoria, Ill.
American Association of Dental Examiners	Oct. 27-28	Atlantic City, N. J.	C. A. Bumstead Secy.	924 Stuart Bldg., Lincoln, Neb.
American Dental Assistants Association	Oct. 30-Nov. 2*	Atlantic City, N. J.	M. L. Martin Exec. Secy.	410 First National Bank Bldg., LaPorte, Ind.
American Society for the Advancement of General Anesthesia in Dentistry	Oct. 23	New York	M. H. Feldman Exec. Secy.	730 Fifth Ave., New York
American Society of Dentistry for Children	Oct. 27-29	Atlantic City, N. J.	G. Tank Chm.	339 Ashbourne Road, Elkins Park 17, Pa.
American Society of Oral Surgeons, Thirty-Second Annual Meeting	Oct. 25-28	Atlantic City, N. J.	H. Bear Secy.	1112 East Clay St., Richmond 19, Va.
Greater New York Dental Meeting	Dec. 4-8	New York	A. E. Corby Chm. Press Publication	Room 106A, Hotel Statler, New York 1
Italian Medico-Dental Association, Twenty-Fifth Annual Convention on Stomatology	Sept. 26-30	Stresa (Lake Maggiore)	Enrico Goia	Via Lamarmora, 9, Torino, Italy
Mid-Continent Dental Congress, Tenth Annual Meeting	Nov. 26-29	St. Louis	J. E. Brophy Exec. Secy.	927 Syndicate Trust Bldg., St. Louis 1
New England Dental Society, Annual Meeting	Oct. 4-5	Boston	A. R. Wilson Secy.	43 Farmington Ave., Hartford, Conn.
New Orleans Dental Conference	Nov. 5-8	New Orleans	M. R. Matta Secy.	8117 Oak St., New Orleans
Northeastern Society of Orthodontists, Annual Meeting	Nov. 6-7	Washington, D. C.	O. Jacobson Secy.	35 W. 81st St., New York
Odontological Society of Western Pennsylvania	Nov. 14-16	Pittsburgh	W. E. Craig Secy.	206 Jenkins Bldg., Pittsburgh 22

*Examination for Certification.

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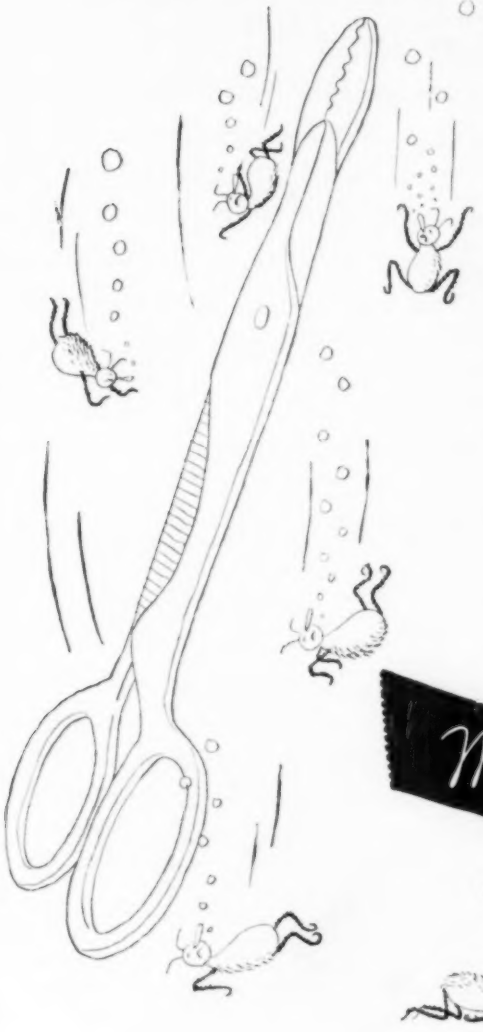

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21	Boscobel	3.00 - 4.00	6.00 - 7.00	
1	Breakers	5.00 - 9.00	7.00 - 14.00	
27	Brighton	6.00 - 10.00	8.00 - 14.00	18.00 - 28.00
9-10	Chalfonte-Haddon Hall	6.00 - 10.00	8.00 - 18.00	20.00 - 34.00
38	Chelsea	5.25 - 6.75	6.75 - 15.00	21.00 - 28.50
4	Clarendon	5.00 - 6.00	7.00	
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29	Crillon ★		8.00 - 10.00	
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16	Flanders	5.00	7.00 - 9.00	
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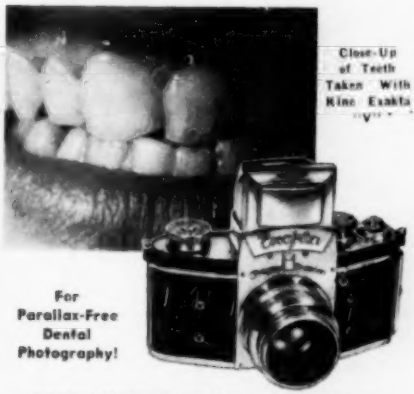

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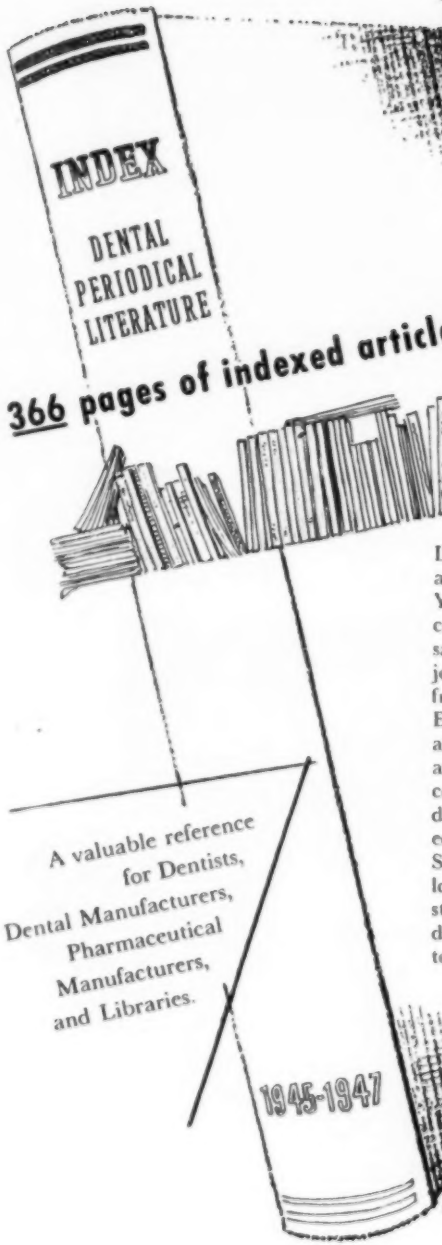

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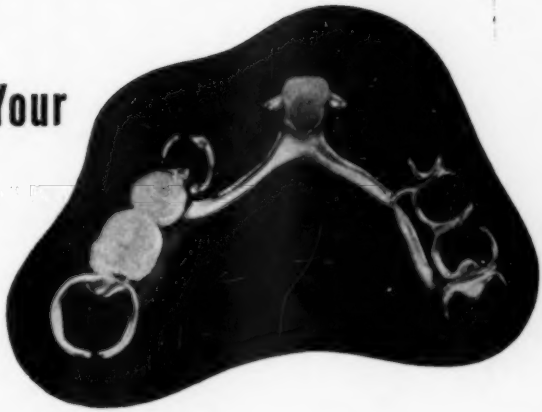

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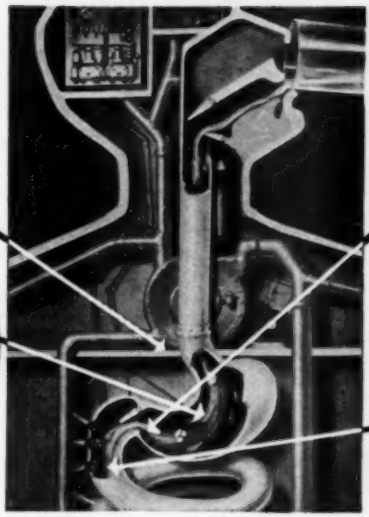

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FOR SALE—Bungalow practice in best Iowa town over 80,000. Modern Ritter equipment. Well established; immediate income. Wonderful opportunity for right man. Address A.D.A. Box 175.

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FOR SALE—Bungalow type office, with or without equipment, in suburb of Chattanooga, Tennessee. Seven rooms, plus four utility and supply rooms. Fine practice, established 11 years, good income and reputation. Excellent opportunity. Reasonable. Address A.D.A. Box 173.

•

FOR SALE—By woman dentist in large city, Northern Indiana. Beautiful two-chair office completely equipped, including x-ray. Address A.D.A. Box 174.

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FOR RENT—Front suite of offices, centrally located on main street, suitable for dentist or physician. Lucrative dental practice previously established. Write Mrs. C. Woloshin, 5 Rutger Park, Utica, N. Y. Phone 2-0620.

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FOR RENT—Four room suite, desirable location for dentist, Joseph Halton Hospital Building, Sarasota, Florida. Address replies to Joseph Halton, M.D.

•

FOR RENT—Valley Stream, N. Y. Medical Arts Building office available for orthodontist or dentist. Population 30,000. 4 room suite, street floor, modern, decorated. Rental $68 per month. Write to owner, Leonard Goldberg, Box 92, Hewlett, N. Y. Phone Franklin 4-0471.

OPPORTUNITIES AVAILABLE

WANTED—By philanthropic foundation, dentists under 40 years of age for public health work. Starting salary rate $4,500 per annum. Michigan licensure not required, provided the individual is a graduate of an accredited dental school and is licensed in another state. For detailed information, write Kenneth R. Gibson, D.D.S., M.S.P.H., Director, Child Health Division, Children's Fund of Michigan, 660 Frederick St., Detroit 2, Michigan.

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WANTED—Dentist to take over general practice in St. Louis, Missouri, starting September, 1950, for period of fifteen months. Owner undertaking graduate work in Orthodontia. No investment required. State qualifications. Address A.D.A. Box 160.

WANTED—Small community in Red River Valley, N. D., requires the services of a dentist. Large territory to serve. Contact Dr. G. S. Wheeler, Portland, N. D.

●

WANTED—Dentist for prosperous, modern farm community in rich, irrigated valley. Population of trade area approximately 4,500. No dentist at present. Office space and housing available. Active practice assured. Direct replies to Gordon Merriam, M.D., Fairview, Montana.

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WANTED—Intern, by the North Carolina Baptist Hospital, approved by the A.D.A. Council on Hospital Dental Service, connected with the Bowman Gray Medical School and jointly operated. Well equipped out-patient department having the hearty support of the surgical staff. Term beginning immediately. Address replies to Dr. J. C. Watkins, Dental Director, 1508-11 Reynolds Building, Winston-Salem, N.C.

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WANTED—Dentist, in thickly-populated Kentucky community. Equipped dental office and home available. Work with two physicians. Situation available either on a rental or percentage basis. Excellent opportunity and good collection system through payroll. Address A.D.A. Box 169.

OPPORTUNITIES WANTED

YOUNG DENTIST—Over one year hospital training—wants group Clinic or buy out practice in or near Allentown, Pennsylvania, or town of equal size in Pennsylvania. Address A.D.A. Box 171.

●

WANTED—General practice in town of 5,000 to 25,000, Wisconsin or Illinois. Address A.D.A. Box 166.

WANTED—Position in field allied to dentistry: institutional, industrial, health insurance or publications. Visual impairment, although permitting reading and travel, necessitates retirement from 12 year successful private dental practice. Address A.D.A. Box 170.

EQUIPMENT FOR SALE

FOR SALE—Ritter equipment; complete operating room, latest style, including x-ray, motor chair, senior E-3 unit. Address replies to Dr. J. O. Bower, Jr., 2008 Walnut St., Philadelphia 3, Pa. Phone Spruce 4-0220.

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WANTED—Old Dental Books—Orthodontia Journals; Old Dental Prints—Advertisements. Leo L. Bruder, 1 De Kalb Avenue, Brooklyn, N. Y.

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OPPORTUNITIES AVAILABLE

(a) Dentist for institutional appointment; hunting and fishing area of the West; $4500—$5700, house, including maintenance.

●

(b) Dental intern or resident; large teaching hospital, South; $200 maintenance.

●

(c) Public health dentist to direct state program of dental health education; $7200-$8400.

●

(d) Associate; general practice, long established, college town, Massachusetts; partnership.

●

(e) Two dentists to join department of dentistry, health department, public schools; Indiana.

●

(f) Assistant; general practice of dentistry; two or three years' experience desirable; salary, percentage; eventual partnership; college town, near Chicago.

●

(g) Experienced oral surgeon to take over long established oral surgery practice; should be over 35 years old with several years experience in oral surgery; California.

●

(h) Dentists with teaching experience or graduate training for following departments: prosthetic dentistry, operative dentistry, crown and bridge prosthesis, oral diagnosis, children's dentistry.

●

(i) General dentist and, also, pedodontists to join dental department, private practice clinic and hospital; present staff consists of seven dentists; winter resort area; Southwest.

●

(j) Dentists to become associated with dental department, large industrial organization; vicinity Baltimore.

●

(k) Oral surgeon to become associated with oral surgeon, long established Chicago area.

●

(l) Dentist to become associated with dentist long established in fasionable resort town; Southern California.

●

(m) Young orthodontist to become associated with orthodontist well established in Chicago.

●

(n) Resident in oral surgery; well established clinic, staff of 26 outstanding specialists, university town of 50,000, Midwest.

●

(o) Dentist for general practice; group association modernly equipped dental department, excellent laboratory facilities, starting salary $500, percentage later; Indiana.

●

(p) Pedodontist to become associated with dentist, busy general practice; university town, Midwest.

The Medical Bureau (cont'd)

(q) Dentist to become associated with school health department; opportunity for obtaining excellent training in children's and public health dentistry; 5-day week; duties those encountered in any well regulated private practice; excellently equipped department; Middle West.

WANTED

(a) Dental hygienist to become associated with dentist well established in town of 15,000, Pennsylvania.

•

(b) Dental hygienist, industrial company engaged in construction project in tropical island; man required; $85-$90 weekly; bonus, transportation.

OPPORTUNITIES WANTED

Young oral surgeon wishes association; B.S., D.D.S., eastern schools; year's internship and two-year residency in oral surgery, teaching hospital.

•

Dentist, now completing year's graduate training consisting of six months in anesthesia and six months in oral surgery, is available; three years' general practice experience.

•

Oral surgeon; B.A., D.D.S., M.S. (Oral Surgery); several years' successful general practice before specializing; eligible for American Board examinations.

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Young dentist is available for association in general practice of dentistry; graduate of Northwestern; two years' general practice; licensed, Texas, Illinois.

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Dentist seeks appointment in general practice with emphasis on prosthodontia; D.D.S., Minnesota; year's dental internship, teaching hospital; held administrative appointment during World War II; several years' association with group clinic.

•

Dentist trained, experienced public relations; eight years' successful practice; teaching, writing experience; prefers position, administrative character involving public relations.

•

Dentist, D.D.S., Northwestern University Dental School, is available for opportunity in pedodontics; training consists of year's graduate training and year's internship, children's dentistry.

•

Dentist particularly well trained in periodontia; B.S., D.D.S., eastern university; year's dental residency, teaching hospital; graduate training in peridontia; three years' training in general practice before specializing; two years' practice limited to periodontia.

Ann Woodward, Director
Woodward Medical Personnel Bureau
185 N. Wabash Avenue
Chicago 1, Illinois

OPPORTUNITIES AVAILABLE

D-160—DENTIST: for association with large Eastern Corporation in a sales capacity ultimately leading to a proprietary interest. Liberal proposition for right man.

•

D-133—GENERAL DENTIST: Clinic group recently formed, 20 miles from large Indiana industrial and commercial city. 4 man group—salaried appointment.

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D-252—LOCATION for Dentist: Small privately owned Hospital. Excellent Western resort area, estimate $15,000 income—more if qualified in dental surgery.

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D-124—DENTIST: Clinic opportunity, percentage or lease basis, expanding group. Dental department completely equipped. Southern Border State—excellent potential remuneration.

•

D-140—UNOPPOSED LOCATION: Community in urgent need of a dentist, will cooperate in every way to get a young man established. Northwest.

•

D-157—ORAL SURGEON: Opportunity for qualified man to practice independently with medical and dental group covering 8 specialties. All certified men. Excellent remuneration possibilities—group serves population of 100,000. Pacific Northwest.

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D-161—DENTIST: Staff Appointment, Midwest hospital, large industrial and cultural community. Salary open.

D-153—ORAL SURGEON: to associate as junior partner with renowned Chicago specialist. Must be well qualified, experienced, and under 46. Wonderful practice, Dr. contemplating retirement few years.

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D-159—ORAL SURGERY RESIDENCY: 1 year appointment for class A school graduate wishing to specialize. P.G. in Oral Surgery preferred, Approved training—possibility of staff appointment later. Central Midwest hospital clinic.

•

D-162—OPENING for 1st or 2nd year intern or assistant resident in Exodontia, Anesthesia, and Oral Surgery. Program under direction of American Board men. Southwest Hospital.

OPPORTUNITIES WANTED

(a) Young Oral Surgeon with MS and 2 years hospital staff experience desires to relocate. Also experience in Orthodontia and Prosthodontia.

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(b) Dentist: DDS Columbia, Law Degree, 20 years experience in general dentistry, Orthodontia, Root Therapy, Endodontia, Surgical Prosthesis, Color technology, Research. Author and Lecturer. Wants industrial or institutional opportunity in research or administrative field, or any good offer.

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(c) Oral Surgeon—Age 34, D.M.D. and B.S. from State University. Just completed 3 year fellowship at Mayo Foundation. Will consider any type of appointment in oral surgery. Immediately available.

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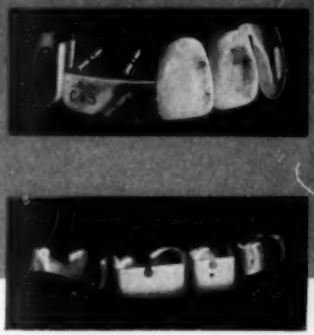

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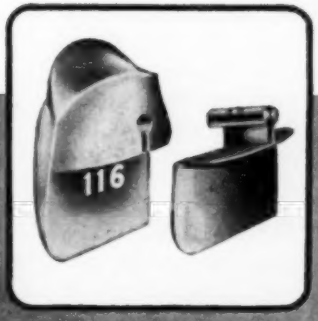

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Save Those Teeth (16 mm., sound, black and white, 11 min.). Action centers around demonstrations made by Dr. Orfield to Dan, aged 11 . . . proper care involves four principal factors; (1) adequate brushing, (2) proper food, (3) restricted use of sugar, and (4) fluoride treatment . . . for school children, parents and teachers. Purchase, Encyclopaedia Britannica Films Inc., Wilmette, Ill., $50. Rent, American Dental Association, $2.50 per day, $4.50 per week.

Dental Health: How and Why (16 mm., sound, color, 10 min.). By means of a story about Jerry, 12 years old, and Susie, 6 years old, with their family and friends, the "how" and "why" are presented . . . explaining (1) adequate diet, (2) fluoride treatments, (3) daily dental care, and (4) the role of the dentist . . . for school children, parents and teachers. Purchase, Coronet Films, Chicago 1, color $90, black and white $45. Rent, American Dental Association, $2.50 per day, $4.50 per week.

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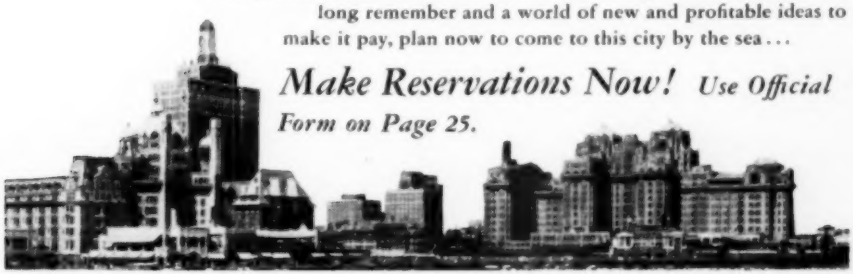

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